BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 13-217

1 JUNE 1999

Space, Missile, Command, and Control

ASSAULT ZONE PROCEDURES

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFPD 13-2, *Air Traffic Control, Airspace, Airfield and Range Management.* This publication prescribes the procedures, techniques, and requirements for operating assault zones. It governs the content, documentation, and approval process for assault zone surveys. This publication applies to all active duty airlift forces. It applies to the Air National Guard (ANG) when published in NGR (AF) 0-2 and to the United States Air Force Reserve Command (AFRC) when published in AFRESR 0-2, Vol. 2.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed. This revision contains several changes in procedures for assault zone survey review and approval. Paragraph 2.2, Responsibility, has been added to clarify the roles of all parties involved in assault zone operations. Sections pertaining to Assault Landing Zone (ALZ) personnel requirements have been revised. Procedures governing USAF jump operations have changed, including revised wind limitations and power line restrictions. Procedures for reporting off DZ airdrops have been added. Several of the figures have been consolidated and reformatted in an attempt to make them more useable. The point of reference for calculating circular DZs has changed to the center point, which may not necessarily coincide with the point of impact, and the size criteria for Simulated Airdrop Training Bundle (SATB) drops has been revised to facilitate training. Distances have been listed in multiple units of measurement or converted to meters. All references to Landing Zone (LZ) have been changed to ALZ. Additional information regarding general ALZ criteria has been added to chapter 3. Instructions for AF Form 3822, **Landing Zone Survey,** and AF Form 3823, **Drop Zone Survey** have been removed and will be published with the revised AF Forms at a later date. All Combat Control forces have been placed under AFSOC in the 720 Special Tactics Group (STG) and are now referred to as Special Tactics (ST) forces, or Special Tactics Squadrons (STS). Requests for ST support should be directed to 720 STG, Hurlburt Field FL.

Chapter 1

INTRODUCTION

1.1. General. This publication outlines assault zone size and marking criteria, aerial delivery methods and parameters, operating procedures for qualified personnel, and assault zone survey request and review processes. Use this publication in conjunction with aircraft flight publications and applicable USAF and MAJCOM directives.

1.2. International Agreements. The Air Force must abide by and implement certain international military standardization agreements. This regulation implements International Civil Aviation Organization (ICAO), Air Standardization Coordinating Committee (ASCC) Air Standards, North Atlantic Treaty Organization (NATO), and Standard NATO Agreement (STANAG) agreements. These include but are not limited to Air Standards 44/35G, 44/37C, and STANAGs 3146, 3345, 3570 and 3601.

1.3. Waiver Authority. During the planning and execution phases, waiver authority rests with each MAJCOM and may be delegated by each MAJCOM to an appropriate subordinate agency. MAJCOMs will provide HQ USAF/XOOS copies of approved waivers.

1.4. Recommended Changes. Submit proposed changes through channels to HQ USAF/XOOS on AF Form 847, **Recommendation for Change of Publication**.

1.5. Assault Zone Survey Requests. No later than 120 days prior to scheduled use, contact 720th STG, Hurlburt Field, FL to request a survey. 720th STG will track all survey requests to avoid duplication. Call 720 STG/DO at DSN 579-6055/4250, Comm (850) 884-6055/4250.

1.6. Assault Zone Availability Report (AZAR). The AZAR is a comprehensive listing of assault zones available for use by the Department of Defense (DoD). However, the information in the AZAR does not replace the need for a completed survey prior to conducting assault zone operations. Forward completed assault zone surveys to HQ AMC/DOKT for inclusion in the AZAR. Completed surveys are also available via a FAX on demand system located Scott AFB, IL (DSN 576-2899), (Comm 618 256-2899). The Internet site available for military (.mil) users is located at http://www.amc.af.mil/do/dok/azar.htm.

Chapter 2

DZ OPERATIONS

2.1. General. This chapter outlines the basic criteria, markings, and procedures used in support of airdrops. It describes the responsibilities of the Drop Zone Controller (DZC) and the supported unit's Drop Zone Safety Officer (DZSO). It also governs the DZ survey process.

2.1.1. There are three primary methods of acquiring the DZ for an airdrop: Visual, adverse weather aerial delivery system (AWADS)/zone marker (ZM)/radar beacon and global positioning system (GPS). For visual drops, the aircrew drops the personnel/equipment using visual reference to the ground. AWADS/ZM/radar beacon drops use onboard radar or ground-based equipment to acquire the DZ. GPS drops use integrated GPS with high-precision coordinates to determine computed air release point (CARP) location for all aircraft. ***NOTE*:** For C-17 operations, all PI coordinates (other than VIRS) must be relayed to the aircrew no later than 15 minutes prior to the time over target (TOT) if different than planned.

2.2. Responsibility. DZ size and selection are the joint responsibility of the Air Component Commander (ACC) or Commander Air Force Special Operations Forces (COMAFSOF), and the supported force commander.

2.2.1. The flying unit is responsible for airdrop accuracy and safety of flight. The use of standard DZ sizes depicted in figures 2.1. and 2.5. are essential to ensure safe operations; they are required for Air Force unilateral aircrew training, and recommended for joint training airdrops.

2.2.2. The supported ground unit is responsible for establishment, operation, safety on the DZ, and elimination or acceptance of ground hazards associated with the DZ. They are also responsible for airdrop accuracy when using ground marked release system (GMRS) procedures.

2.2.3. The jumpmaster is responsible for airdrop accuracy when jumpmaster directed (JMD) release procedures are used.

2.2.4. The using force will take responsibility for injury of personnel and damage to equipment which could result from using a DZ that does not meet the standard size criteria in figures 2.1. and 2.5.

2.3. Drop Altitudes. During contingency and wartime operations, the airborne commander, in conjunction with the Air Force forces commander, will determine the drop altitude for personnel and equipment drops. Additional guidance for personnel deployments may be found in AFI 11-410, *Personnel Parachute Operations*, 9.2.2. (freefall) and TO 14D1-2-1-21, *Static Line Parachuting Techniques and training* Part four (static line), and AFI 11-231, *Computed Air Release Point Procedures* for CARP.

2.4. Drop Airspeeds. Standard parachute airdrops are performed at the airspeed ranges indicated in MDS specific aircraft AFIs and AFI 11-231 (for CARP).

2.5. DZ Criteria. During exercises and contingencies, DZ size and selection criteria are the joint responsibility of the ACC, or COMAFSOF, and the supported forces commander. DZ selection should be based on enemy threats, mission requirements, aircraft and/or aircrew capabilities, parachutist capabilities, type parachutes used, and type equipment to be airdropped. ***NOTE*:** The minimum DZ sizes depicted in Figures 2.1. and 2.2. are required for airdrop accuracy during AF unilateral training and recommended for

joint training airdrops to ensure safe operations. Airdrops of U.S. personnel and/or equipment from USAF aircraft on DZs that do not meet minimum AF minimum size requirements must be waivered IAW para. 1.3. Additionally, waivered DZ drops are scored based on the AF minimum DZ size criteria. For example, a waivered DZ is 100 yards short of AF minimum size. The drop is considered on the DZ if personnel/equipment land within the 100-yard difference between the minimum and waivered DZ boundaries.

2.5.1. Military Free Fall (MFF) DZs. The jumpmaster will determine the minimum size DZ based on the number of personnel to be dropped, jumper proficiency, and the prevailing winds. See paragraph 2.23.4. for demonstration DZs.

2.5.2. Random Approach DZs. A random approach DZ is a variation of a previously surveyed DZ and of sufficient size to permit multiple run-in headings. Any axis of approach may be used as long as the resulting DZ meets the minimum criteria for the load being airdropped and remains within the boundaries of the original surveyed DZ (see figures 2.1. and 2.5.). In all cases, a safety of flight review will be performed (see paragraph 2.23.1.2.) prior to use.

2.5.3. Area DZs. An area DZ (figure 2.6.) consists of a start point (point A), an endpoint (point B), and a pre-arranged flight path (line-of-flight) over a series of acceptable drop sites between these points. The distance between points A and B generally should not exceed 15 nautical miles and changes in ground elevation along the line-of-flight should not exceed 300 feet. Drop sites along the line-of-flight should not be located more than 1/2 nautical mile on either side. The reception committee may receive the drop at any location along the line-of-flight. Once the pre-briefed signal or electronic NAVAID has been identified and located, the drop may be accomplished. ***NOTE*:** For C-17 operations, PI coordinates must be relayed to the aircrew no later than 15 minutes prior to the TOT.

2.5.4. Circular DZs. The size of the DZ is governed by mission requirements and usable terrain. The PI of a circular DZ is normally at the DZ center to allow for multiple run-in headings (see figure 2.5. Option 1). For specific missions, the PI location may be adjusted to allow for sequential HE, mass CDS, etc. on circular DZs (see figure 2.5. Option 2). However, this limits the run-in heading to only one direction. In all cases, the minimum DZ dimensions for the type and number of loads being dropped must completely fit into the surveyed circular DZ. Refer to figure 2.5 to determine whether the minimum DZ fits into the surveyed circular DZ. For cases where the PI has been relocated, use figure 2.5. Option 2. ***NOTE*:** The circular DZ size recorded on drop zone survey forms will be calculated using fig. 2.5. Option 1. This will prevent confusion and reduce the risk of off DZ drops if the circle centerpoint is used as the PI.

2.5.5. Random Points of Impact (RPI). When mission requirements dictate, the RPI placement option may be used. This option may be exercised in two ways. Option One: The mission commander will notify the DZC at least 24 hours in advance that RPI placement will be used. When the DZ is established, the DZC will randomly select a point on the DZ and establish that point as the PI for the airdrop. In this case, the DZC will ensure that the DZ minimum size requirements for the load being dropped are met and that the entire DZ falls within the surveyed boundaries. Option Two: The mission commander or supported force commander may request the DZ established with the PI at a specific point on the DZ. These requests must be made at least 24 hours in advance. The requester will ensure that the minimum DZ size criteria is met for the type load being dropped and that the entire DZ falls within the surveyed boundaries. These procedures will only be used during visual meteorological conditions (VMC) operations.

2.5.6. Multiple Points of Impact (MPI). MPI airdrops are authorized if all personnel involved have been properly briefed. MPI airdrops are defined as an aerial delivery method that allows for the calculated dispersal, both laterally and longitudinally, of airdropped loads to predetermined locations on a DZ. The DZ must meet the minimum size requirements for each PI and the precise location of each PI must be provided to aircrews (see figures 2.1. and 2.2.). MPIs can be marked using standard markings or non-standard markings that are dictated by the tactical situation (see Single Marked MPIs, 2.12.5.). If the points are placed laterally, the DZ width must be increased accordingly to meet the distance criteria from the DZ edge to the PI. This manner of placement reduces the effects of wake turbulence across the DZ (see figure 2.2.). **NOTE:** C-17 formation personnel airdrop may require offset (laterally displaced) PIs. When required, offset PIs will be 250 yards left and right of the centerline personnel PI. Offset PIs for night personnel drops will be marked using flanker lights.

2.5.7. Simulated Airdrop Training Bundles (SATB) DZs. When conducting day / night single-ship or day formation airdrops, crews may use a 300 yard radius circular DZ. Increase DZ radius by 20 yards for C-130 and 100 yards for C-141 night / station keeping equipment (SKE) formations conducted during VMC. SATB airdrops conducted during actual instrument meteorological (IMC) conditions must follow the standard DZ size criteria for the type SATB airdrop being conducted. SATB airdrops conducted on military reservations / restricted areas can use standard CDS DZ size criteria. This option facilitates training. ***NOTE:*** C-17s do not perform SATB airdrops.

2.5.8. Water DZ Criteria. Water DZs are normally circular and should meet the minimum size criteria listed in figures 2.1. and 2.5.. Additional restrictions are at the discretion of the using unit.

2.5.8.1. DZ water depth must be a minimum of 10 feet and the area must be free of underwater obstructions to that depth.

2.5.8.2. The surface must be free of floating debris or moored craft. There should be no protruding boulders, stumps, pilings, or other hazards within 400 meters of the center of the DZ. ***NOTE:*** Test and demo jumps may utilize water DZs with obstacles within 400 meters of the center of the target area. This exception will not be used to allow repetitive operations into the same DZ encompassing hazardous obstacles.

2.5.8.3. The DZ should not be located near swift currents. For personnel drops, the current should not exceed 2 knots. When current speed measuring equipment is not available, and oceanographic/tidal charts depict currents in excess of 2 knots, drops must be waivered IAW Para. 1.3.

2.5.8.4. For training, sea state limits are based on the ability of recovery assets to quickly locate and recover jumpers and their equipment. For contingencies, sea state limits are at the discretion of the jumpmaster. See Attachment 2 for wind/sea state prediction chart.

2.5.8.5. Unilateral training support requirements for water DZ operations:

2.5.8.6. At least one safety boat must be on the DZ with the DZC on board. Recovery crew qualifications must meet using services guidance. Radio communication with the aircraft is preferred, however, a pre-briefed visual or electronic signal may be used. To preclude misidentification of the DZ, an authentication method other than a single boat on the DZ is recommended.

2.5.8.7. Medical support must be on the scene prior to personnel airdrops. If medics are not in the same safety boat as the DZC, the DZC must have communication with them. Minimum safety boat requirements for USAF unilateral water drops are one boat per six jumpers. An airdropped

combat rubber raiding craft (CRRC) will not be considered a safety boat until all rigging material has been removed and the boat is operational.

2.5.9. Tactical DZs. Tactical DZs are primarily used during exercises or contingencies. They provide the Joint Forces Air Component Commander (JFACC)/Air Operations Center (AOC) with a means to rapidly respond to user requests through the rapid survey and approval of DZs for use. Tactical DZs are normally restricted to missions supporting actual resupply and personnel infiltration airdrops (versus proficiency jumps, SATBs, etc.). Tactical DZ surveys are done in an abbreviated manner, but still require a physical survey of the DZ, by ST, Theater Airlift Liaison Officer (TALO), or the using unit, to insure DZ suitability. A safety-of-flight review is also required. ***NOTE:*** If a tactical DZ survey is done to meet new run-in axis requirements on an existing survey, then only a safety-of-flight review is required. ***NOTE:*** Tactical DZs will not be used for routine or repetitive training. The tactical DZ option is available when operations are conducted under the auspices of unit or higher headquarters sponsored exercises or real world contingencies. See para. 2.23. for survey procedures.

2.6. IMC Airdrops. For U.S. Army training drops, a minimum ceiling of 200 feet above ground level (AGL) is normally required. This may be waived by the ground force commander / user, but must be identified before the mission is flown. For unilateral training, a ceiling of 300 feet and 1/2 mile visibility is required for personnel airdrops. A ceiling of 200 feet and 1/2 mile is required for unilateral equipment airdrops. During operational missions ceiling and visibility minimums are jointly determined by the airborne, and Air Force commanders. For joint exercises, Air Force personnel are authorized to use Army minimums. When the ceiling is less than 600 feet AGL, clear all personnel from the DZ NLT 5 minutes prior to the scheduled airdrop TOT and ensure they remain clear until completion of the airdrop.

Figure 2.1. Standard DZ Size Criteria.

ALTITUDE (AGL)	**WIDTH (1,3)**	**LENGTH (2)**		
Container Delivery System (CDS) (C-130)				
To 600 feet	400yds/ 366m	Single containers	Double containers	
		1	1-2	400 yds/366m
		2	3-4	450yds/412m
		3	5-6	500yds/457m
		4	7-8	550yds/503m
		5-8	9 or more	700yds/640m
Above 600 feet	Add 40yds/36m to width and length for each 100 feet above 600 feet (add 20yds/18m to each side of DZ, 20yds/18m to each end)			
CDS (C-141, C-17)				
To 600 feet	450yds/ 412m	Single containers	Double containers	
		1	1-2	590yds/562m

ALTITUDE (AGL)	WIDTH (1,3)	LENGTH (2)		
Container Delivery System (CDS) (C-130)				
To 600 feet	400yds/ 366m	Single containers	Double containers	
		2	3-4	615yds/540m
		3	5-6	665yds/608m
		4-8	7-16	765yds/700m
		9-14	17-28	915yds/837m
		15-20	29-40	1065yds/974m
Above 600 feet	Add 40yds/36m to width and length for each 100 feet above 600 feet (add 20yds/18m to each side of DZ, 20yds/18m to each end)			
HIGH VELOCITY (HV) CDS (using 12, 22, or 26 foot ring slot parachutes)				
To 3000 feet	580yds/ 530m	660yds/604m		
		Add 50yds/46m to trailing edge for each additional row of containers.		
Above 3000 feet	Add 25yds/23m to each side and 100yds/91m to each end for every 1000 feet increase in drop altitude			
High Altitude Airdrop Resupply System (HAARS) CDS				
To 3000 feet	500yds/ 457m	One to eight containers: 1200yds/1098m		
		Nine or more containers: 1900yds/1739m		
Above 3000 feet	Add 25yds/23m to each side and 50yds/46m to each end for every 1000 feet increase in drop altitude			
High Speed Low Level Aerial Delivery System (HSLLADS)/HSKS				
	300yds/ 274m	600yds/549m		
RECOVERY KIT				
MC-130	200yds/ 183m	200yds/183m		
AWADS	400yds/ 366m	400yds/366m		
C-130	400yds/ 366m	400yds/366m		
PERSONNEL				
To 1000 feet	600yds/ 549m	1 Parachutist 600yds/549m		
	Additional Parachutist: Add 75yds/69m for each additional parachutist to the trailing edge (PI for STS personnel)			

ALTITUDE (AGL)	WIDTH (1,3)	LENGTH (2)		
Container Delivery System (CDS) (C-130)				
To 600 feet	400yds/ 366m	Single containers	Double containers	
Above 1000 feet	Add 30yds/27m to width and length for each 100 feet above 1000 feet (add 15yds/14m to each side of DZ, 15yds/13m to each end)			
HEAVY EQUIPMENT				
To 1100 feet	600yds/ 549m	1 Platform	1000yds/915m	
	Additional Platforms: Add 400yds/366m (C-130), 500yds/457m (C-141/ C-17/C-5) to the trailing edge for each additional platform			
Above 1100 feet	Add 30yds/28m to width and length for each 100 feet above 1000 feet (add 15yds/14m to each side of DZ, 15yds/14m to each end)			

Note 1: a. For day visual formations, increase width by 100yds/92m (50yds/46m on each side).
b. For C-141, C-130 SKE AWADS formation, increase width by 400yds/366m (200yds/184m on each side).
c. From official sunset to sunrise, increase width by 100yds/92m for single ship visual drops (50yds/46m on each side) or 200yds/184m for visual formations (100yds/92m on each side).

Note 2: Official sunset to sunrise, increase length by 100yds/92m for visual drops (50yds/46m on each end).**Note 3:** C-17 DZ Size Adjustments (more than one may be required):
a. For visual formations (day or night) increase width by 100yds/92m (50yds/46m each side).
b. For night visual airdrop, increase width an additional 100yds/92m (50yds/46m each side) (DOES NOT APPLY TO AIRCRAFT PERFORMING GPS DROPS).
c. For SKE HE/CDS formation, increase width by 400yds/366m (200yds/183m each side).
d. C-17s require SKE to perform personnel formation airdrop. For personnel formations performing GPS drops below 1000 AGL, the minimum DZ width using center Pis is 1240yds for 2-ship elements and 1800 yards for 3-ship elements. When using offset PIs, minimum width is 1100yds for 2-ship elements and 1300yds for 3-ship elements. Above 1000 feet, add 30yds for each 100 feet above 1000 feet as described for personnel airdrop.
e. Single ship IMC drops have no adjustments below 1000 feet. Above 1000 feet, add 30 yards for each 100 feet above 1000 feet.

Figure 2.2. Standard Point of Impact Placement.

TYPE DROP	TYPE AIRCRAFT	DISTANCE FROM APPROACH ENDYARDS/ METERS	
FOR SINGLE AIRCRAFT (see NOTE 1 & 2)		DAY	NIGHT
CDS (see Note 3)	C-130	200/183	250/229
CDS (see Note 3)	C-141/C-17	225/206	275/251
PERSONNEL	ALL	300/274	350/320
EQUIPMENT	ALL	500/457	550/503

TYPE DROP	TYPE AIRCRAFT	DISTANCE FROM APPROACH ENDYARDS/ METERS	
FOR MULTIPLE AIRCRAFT (see NOTE 1 & 2)		DAY	NIGHT
PERSONNEL	ALL	300/274	350/320
EQUIPMENT	ALL	500/457	550/503
NOTE 1: PI location may be adjusted for special operations, or to meet specific mission requirements. Participants must be briefed.			
NOTE 2: PI location may be adjusted for aircrew PI acquisition training. The PI may be located anywhere within the surveyed DZ boundaries as long as the minimum required DZ size for that type airdrop fits within the boundaries. All participants must be briefed when using this option.**NOTE 3:** For HV CDS and HAARS position the PI in the center of the DZ.			

2.7. Wind Criteria.

2.7.1. Altitude Winds. There are no altitude wind restrictions for fixed wing airdrops. Refer to the appropriate MDS-specific aircraft AFI for altitude wind restrictions for rotary wing aircraft. If surface winds (see figures 2.3 and 2.4) are not provided, altitude winds may influence the jumpmaster's decision to drop personnel.

2.8. Aerial Power Line Restrictions. For the purpose of this publication, all restrictions apply to aerial power lines operating at 50 volts or greater.

2.8.1. Power lines present a significant hazard to jumpers. Jumpers can sustain life threatening injuries from electric shock and/or falls from a collapsed canopy.

2.8.2. To reduce this hazard, first attempt to site DZs so no power line falls within 1000 meters of any DZ boundary.

2.8.3. If power lines fall within 1000 meters of any boundary, coordinate with the Power Company to shut off power NLT 15 minutes prior to TOT if possible.

2.8.4. If power cannot be interrupted, the flying mission commander, aircrew, and jumpmaster must conduct a risk assessment of the mission. Include as a minimum; type jump, jumper experience, aircrew experience, ceiling, and surface/altitude wind limits required to approve, suspend, or cancel the operation. To further minimize risks, consider altering the mission profile to raise/lower drop altitudes, utilize JMD/GMRS versus CARP procedures, change DZ run-in/escape headings, or remove inexperienced jumpers from the stick. If possible, mark power lines with visual markings (lights, smoke, or VS-17 panels). ***NOTE:*** At no time will military personnel attempt to climb power line poles to position or affix markings to wires or poles.

2.8.5. If the jumpmaster and aircrew concur with the flying mission commander's assessment, proceed with the operation.

2.8.6. If the jumpmaster and aircrew do not agree on the safety of the operation, the flying mission commander will forward an assessment to the flying unit's safety office, then to the Commander or Director of Mobility Forces (DIRMOBFOR)/Combined Joint Special Operations Air Component (CJSOAC) equivalent, who will to approve, suspend, or cancel the operations.

2.8.7. During USAF MFF operations, the Jumpmaster / Team leader should carefully consider the use of DZs with aerial power lines within 1000 meters of the intended PI. As a minimum, ensure all jumpers are briefed of power line locations.

2.8.8. Non-USAF personnel will comply with their service guidance for power line procedures and restrictions.

2.9. Airdrop Winds. DZ wind information is critical to airdrop accuracy and is used by aircrews to compute the adjusted release point. It is imperative that accurate and timely wind data be transmitted to the aircrew. This includes not only surface wind and the computed mean effective wind, but any unusual observations (i.e., wind shear or local phenomena that could affect wind direction, speed or restrictions to visibility).

2.9.1. Surface Wind. The surface wind at the DZ is normally measured using an anemometer or other calibrated wind-measuring device. Wind direction is reported in magnetic degrees and wind speed in knots. The direction reported is the direction the wind is coming from.

2.9.2. Mean Effective Wind (MEW). The MEW is a theoretical wind of constant speed and direction that extends from the ground to a designated altitude. When required, the DZC determines the MEW by timing the ascension of a helium-filled balloon to a pre-determined altitude and measuring the angle of drift. The MEW is an indicator of the drift line and distance an airdropped object can be expected to travel. Figure 2.7. is used to determine average wind speed from the surface to various drop altitudes.

2.9.2.1. Inflate the 10-gram balloon with helium to a circumference of 57 inches during daylight hours or 74 inches at night. This increase in size compensates for the weight of a small marking light attached to the balloon used for night observations.

2.9.2.2. Two types of marking lights can be used. One type is activated by immersion in water, prior to attachment to the balloon. The other type is commonly known as a chemical light and measures 6 inches in length.

2.9.2.3. Once the balloon is released, its ascent to the required altitude is timed. The ascension tables in figure 2.7. reflect the ascent times required for the balloon to reach various altitudes. This method is also used to estimate the base altitude of cloud layers by determining the ascension time for the balloon until obscured by the cloud base.

2.9.2.4. During ascent, unusual movement by the balloon is indicative of erratic wind conditions and should be noted. The altitude of these occurrences, if significant, should be included in the MEW report to the aircraft.

2.9.2.5. When the balloon reaches drop altitude, the elevation angle is measured with a pocket transit, theodolite, clinometer, or any other accurate means available.

2.9.2.6. The magnetic azimuth to the balloon is measured and the reciprocal heading noted. This will give the MEW wind direction.

2.9.2.7. Referring to the scale on the left side of the table in figure 2.7., locate the angle that corresponds to the angle measured. Move horizontally across the table to the vertical column that corresponds to the drop altitude being used. The value at the intersection of these two lines is the MEW wind speed in knots.

2.9.2.8. When transmitting the MEW, make sure it is identified as the “mean effective wind” and the altitude to which it was taken is included. Any indication of erratic winds or wind shear should be reported at that time (Phraseology: “LIFTER ONE SIX, MEAN EFFECTIVE WIND TO DROP ALTITUDE, THREE FIVE ZERO AT ONE NINER”).

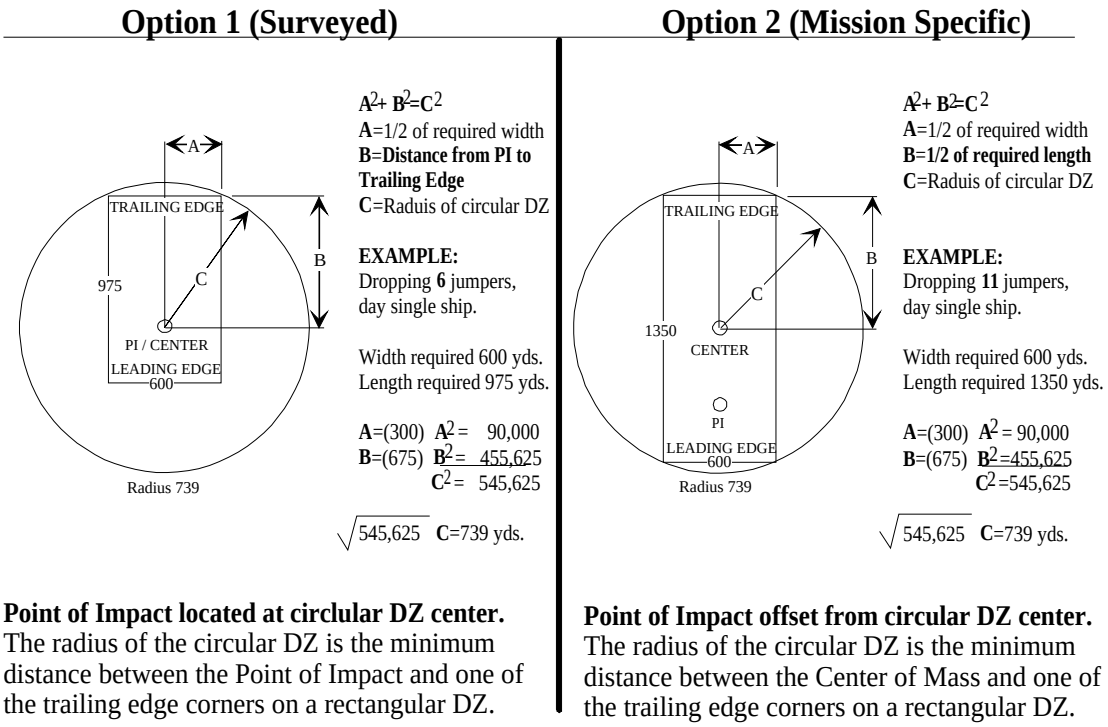
Figure 2.3. Surface Wind Limits for CDS/Equipment Airdrops.

TYPE CDS/EQUIPMENT DROP	SURFACE WIND LIMITS (KNOTS)
AF Equipment	17
AF CDS using G-12 parachutes	13
AF CDS using G-13/14 parachutes	20
HAARS or HV CDS	No Restriction
AF Training Bundles (SATB)	25
Non-AF Equipment	Discretion of unit DZSO

Figure 2.4. Surface Wind Limits for USAF Personnel Airdrops.

TYPE PERSONNEL DROP	SURFACE WIND LIMITS (KNOTS)
AF Static Line (Land)	13
AF Static Line (Water)	25
AF MFF (Land)	17
AF MFF (Water)	25
AF Intentional Tree Jumps	22
NOTE: Non-AF Personnel IAW airborne unit DZSO guidance	

Figure 2.5. Circular DZ computation.



Point of Impact located at circlular DZ center. The radius of the circular DZ is the minimum distance between the Point of Impact and one of the trailing edge corners on a rectangular DZ.

Point of Impact offset from circular DZ center. The radius of the circular DZ is the minimum distance between the Center of Mass and one of the trailing edge corners on a rectangular DZ.

Figure 2.6. Area Dzs.

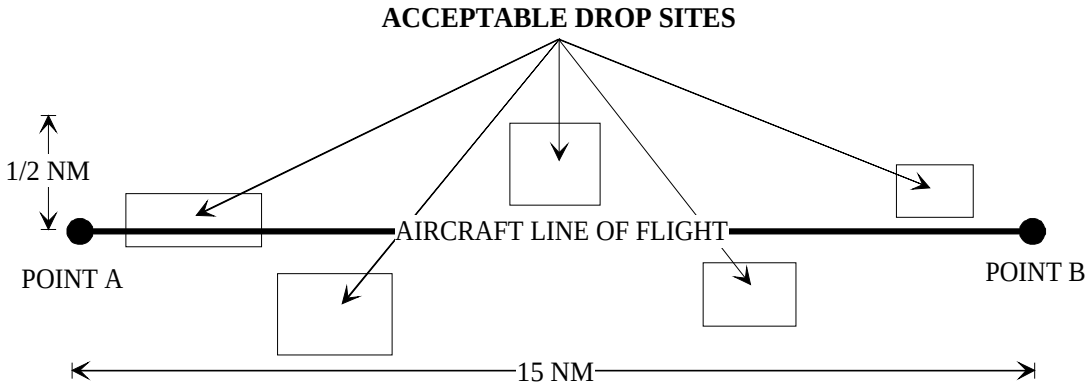


Figure 2.7. Mean Effective Wind Computation Table (10-Gram Balloon).

Conversion Chart For Elevation Changes To Wind Speed In Knots Drift - 100 Ft (33.3yds)/per Knot/per 1000 Ft Ascent Day Circumference: 57", Night Circumference: 74"**ALTITUDE IN FEET**														
		500	**750**	**1000**	**1250**	**1500**	**1750**	**2000**	**2500**	**3000**	**3500**	**4000**	**4500**	**Time/Ht Ascension Rate/Ft**
	70	02	02	01	01	01	01	01	01	01	01	01	01	**0:10/80**
	60	03	02	02	02	02	02	02	02	02	02	02	02	**0:20/170**
	55	03	03	03	03	03	03	03	03	03	03	03	03	**0:30/250**
	50	04	04	03	03	03	03	03	03	03	03	03	03	**0:40/330**
E	45	05	04	04	04	04	04	04	04	04	04	04	04	**0:50/400**
L	40	06	05	05	05	05	05	05	04	04	04	04	04	**1:02/500**
E	35	07	06	06	06	06	05	05	05	05	05	05	05	**1:10/540**
V	30	08	07	07	07	07	07	07	07	06	06	06	06	**1:20/610**
A	25	10	09	09	09	08	08	08	08	08	08	08	08	**1:30/670**
T	24	11	10	09	09	09	09	08	08	08	08	08	08	**1:43/750**
I	23	11	10	10	09	09	09	09	08	08	08	08	08	**1:50/790**
O	22	12	11	10	10	10	10	09	09	09	09	09	09	**2:25/1000**
N	21	12	11	11	10	10	10	10	10	10	10	10	10	**2:44/1100**
	20	13	12	11	11	11	11	11	10	10	10	10	10	**3:05/1250**
A	19	14	13	12	12	11	11	11	11	11	11	11	11	**3:49/1500**
N	18	15	13	13	12	12	12	12	12	11	11	11	11	**4:30/1750**
G	17	16	14	13	13	13	13	12	12	12	12	12	12	**5:11/2000**
L	16	17	15	14	14	14	13	13	13	13	13	13	13	**6:34/2500**
E	15	18	16	15	15	14	14	14	14	14	14	14	14	**7:58/3000**
S	14	19	17	16	16	16	15	15	15	15	15	15	15	**9:22/3500**
	13	21	19	18	17	17	17	17	17	17	17	17	17	**10:44/4000**
	12	22	20	19	19	18	18	18	18	17	17	17	17	**12:08/4500**
	11	24	22	21	21	20	20	20	19	19	19	19	19	
	10	27	25	23	23	22	22	22	21	21	21	21	21	
	09	30	27	26	26	25	24	24	24	23	23	23	23	
WIND SPEED IN KNOTS (10 GRAM BALLOON) ***NOTE:*** 88 Ft/Sec = 60 MPH														

2.10. DZ Markings. A marked DZ is defined as a DZ that has a PI or release point marked with a pre-coordinated visual or electronic signal. Standard DZ markings consist of raised angle markers (RAM), VS-17 marker panels, visible lighting systems, and light beacons. Virtually any type of lighting or visual marking system is acceptable if all participating units are briefed and concur. Night markings or visual acquisition aids may include a light gun, flares, fire pots, railroad fusees, flashlights, chemlights,

and infrared (IR) lighting systems. Electronic NAVAID markings (ZM, SST-181, GAR-I, Tactical Aid to Navigation (TACAN), etc.) may be used for either day or night operations and placed as directed by mission requirements.

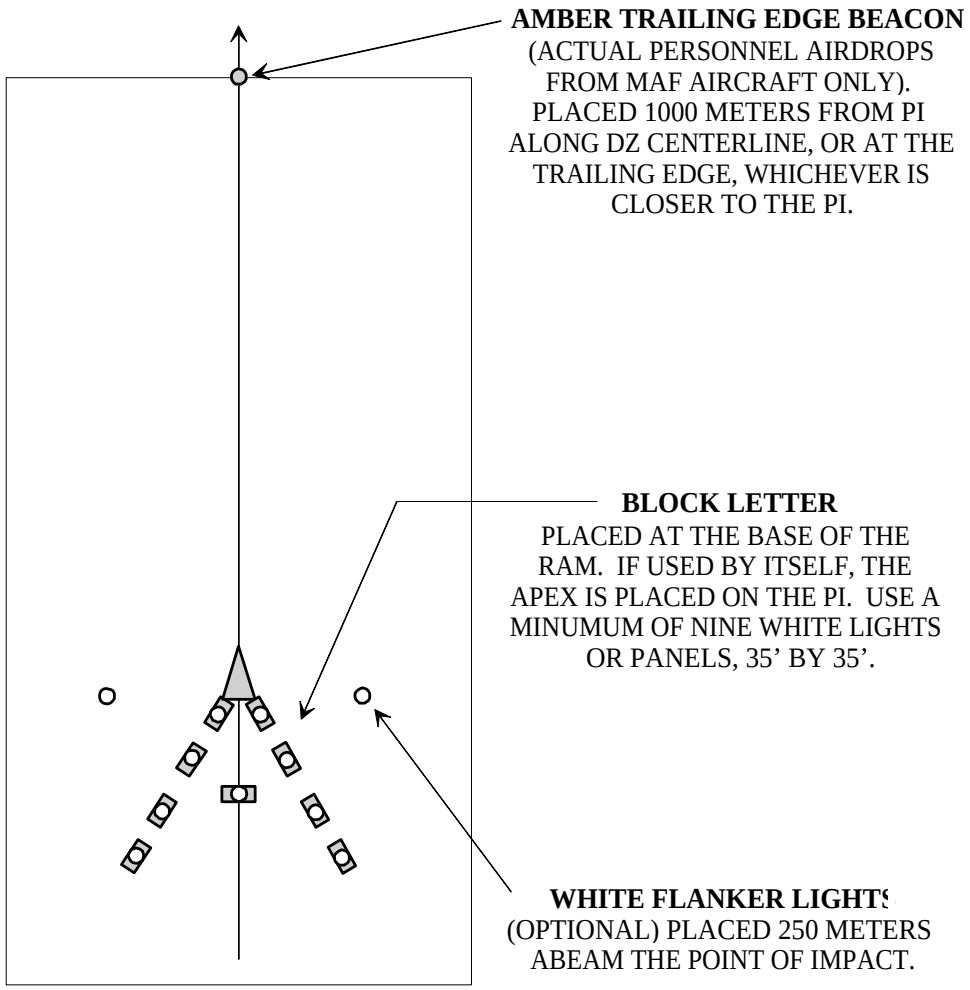
2.11. Standard DZ Markings.

2.11.1. During day operations, the PI will be marked with a RAM or block letter. If authentication is required, a block letter will be used instead of the RAM. Authorized letters for PI markings are A, C, J, R, and S. The block letters H and O are authorized for circular DZs. The block letters should be aligned with the surveyed DZ axis or with the aircraft line-of-flight, if different from the survey. The minimum size for block letters is 11 meters (35 feet) by 11 meters and consists of at least nine marker panels (see figure 2.8).

2.11.2. During night operation, the PI will be marked with a block letter and flanker lights. The apex of the block letter will be located on the PI. Flanker lights will be white and located 250 meters left and right abeam the PI. The minimum size is 11 meters by 11 meters and consists of at least nine white lights, with a recommended minimum output rating of 15 candela. A trailing edge beacon will be used during actual personnel airdrops. When used, the amber trailing edge beacon will be placed along the surveyed DZ centerline 1000 meters from the PI, or at the DZ trailing edge, which ever is closer to the PI. During pre-mission coordination for personnel drops, aircrews will identify to STS or DZC their trailing edge beacon requirements. For all airdrops, the DZ identification must be coordinated and briefed to the ground party and aircrews (see figure 2.8.).

2.11.3. IR Lighting Systems. When mission requirements dictate and aircrews are qualified and equipped, IR lights may be substituted for overt lights using the DZ marking patterns specified in paragraph 2.11.2.

Figure 2.8. Standard DZ Markings.



2.12. Special Use DZ Markings.

2.12.1. The tactical situation may dictate that nonstandard DZ markings are used. When nonstandard markings or identification procedures are used, it is imperative that all appropriate participants be thoroughly briefed.

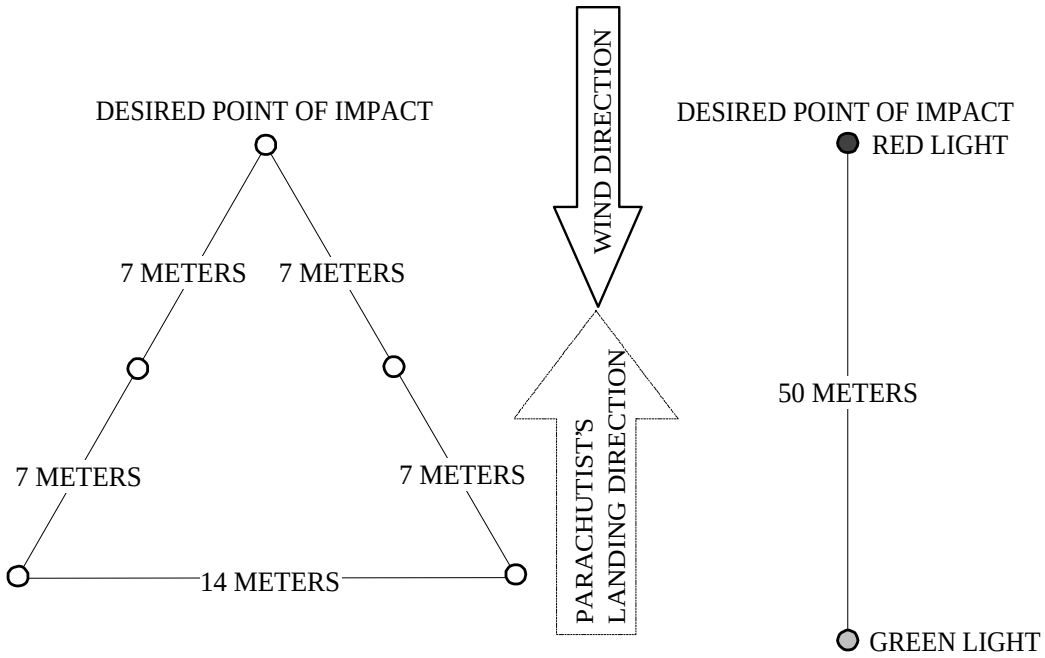
2.12.2. Blind DZ. This type of DZ is not authenticated with any type of visual or electronic marking. Unmarked DZs are normally used for contingency operations and may not have a DZ party present. Combat control and pararescue personnel are authorized to drop on unmarked DZs. During training missions, a DZC party must be on site for safety.

2.12.3. MFF DZ Markings. The two DZ marking systems commonly used during MFF operations are the wind arrow and the two-light system (see figure 2.9.).

2.12.3.1. Wind Arrow. The arrow is formed by placing visual markers on the ground in the shape of an arrowhead. Align the arrow pointing into the wind. Place the arrow tip marker on the desired impact point. Jumpers fly their approach to landing facing the direction of the arrow.

2.12.3.2. Two-Light System. The two-light system consists of one red light and one green light. The red light is placed on the desired impact point and the green light is placed between 15 and 50 meters downwind. Jumpers will be briefed on the actual separation of lights. Jumpers fly their approach to landing from green light to red light.

Figure 2.9. MFF DZ Markings.



2.12.4. Water DZ. Water drops can be conducted on marked or unmarked DZs. Marked DZs will have mutually agreed upon markings (visual or electronic). Select markings that do not mimic local maritime navigational aids (buoys, channel markers, etc.).

2.12.4.1. Marked Water DZs. GMRS, VIRS, CARP, or JMD (including moving target) procedures may be used on marked DZs. For GMRS, the position of the recovery or safety boat usually marks the intended release point. For water JMD drops, use moving target procedures (see Attachment 3). Other options may be used to mark DZs; however, these markings must be pre-briefed.

2.12.4.2. Unmarked Water DZs. Unmarked water DZs will have predetermined PIs. Include coordinates of the PI in the aircrew, DZC and jumpmaster briefings.

2.12.5. Single Marked Multiple Points of Impact (MPI). Single Marked MPI procedures are authorized for Heavy Equipment/Container Delivery System (HE/CDS) airdrops where only the first PI in a series of MPI is marked and all personnel involved have been properly briefed. Single Marked MPIs are restricted to along the DZ axis (no lateral displacement) and to a maximum of 1500 yards between

the first marked PI and the last unmarked PI. The DZ must meet the minimum size requirements for each PI and the precise location of each PI must be provided to aircrews (see figures 2.1. and 2.2.).

2.13. Airdrop Communications. To the maximum extent possible, airdrop operations should be planned to operate with minimum radio transmissions. In general, all missions are flown as planned with additional radio calls made "by exception" only. Authentication is accomplished as required. Detailed mission planning and pre-briefed operating procedures can eliminate many flight-following and formation-only transmissions. Radio contact with the drop aircraft should be limited to safety of flight requirements or issues affecting airborne force employment. This includes ATC directions, range clearance, unsafe surface conditions or mission changes. DZ winds or other information may be broadcast in the blind at a coordinated time prior to the scheduled TOT.

2.13.1. Drop clearance to a marked DZ is normally inherent with mission clearance and is confirmed by the aircrew observing the prebriefed visual DZ markings. Unless radio communications are specifically required, any coordinated markings, other than red smoke, red flares, or red lights indicates clearance to drop.

2.13.2. Training airdrops (both unilateral and joint) conducted during IMC or to an unmarked DZ require the DZC to relay drop clearance, ("Cleared to Drop"), to the aircraft by way of radio communications or other pre-briefed method. Drop clearance is usually accomplished a minimum of 2 minutes prior to the scheduled TOT.

2.13.3. Mission clearance provides drop clearance on operational missions to DZs where no reception party is present.

2.13.4. No-Drop Signals. An emergency "no drop" condition or closing of the DZ is indicated in one of the following ways: placing an "X" at the base of the identifier letter, changing the identifier letter into an "X", removing the code identifiers and other markings, or by using red smoke/flares/lights.

2.13.4.1. An emergency "no drop" situation during IMC operations will be indicated by: the absence of pre-briefed electronic devices(s), or an authenticated radio transmission.

2.13.4.2. To indicate a temporary closing of the DZ, go-around procedure for aircraft, or temporary postponement of air drop, place a symbol comprising two parallel bars formed by panels at the base of the identifier letter with the bars parallel to the DZ axis. Security permitting, these visual signals may be confirmed by radio with the aircraft.

2.13.5. When using radio communications, the following procedures apply:

2.13.5.1. "No drop" advisories should be transmitted early enough to allow time for authentication; specifically, not later than 1 minute prior to actual TOT, unless an emergency arises.

2.13.5.2. If last minute conditions preclude a safe drop and time for proper authentication is not available, the DZC will immediately and repetitively transmit cancellation of drop clearance, ("No Drop, No Drop, No Drop").

2.13.6. Authorized Relays:

2.13.6.1. Relay operational information to the aircraft as requested when abnormal conditions necessitate such requests. DZCs should not be required to handle such messages on a regular basis.

2.13.6.2. If necessary, inform the aircraft of the source of any messages being relayed (DZSO, DZC, ground forces commander, etc.).

2.13.6.3. Transmitting the reason for an aircrew initiated "No Drop" is not normally required. However, if time permits, the aircrew will pass the information to the DZC. For ground initiated "No Drops", (if time and security requirements permit), the DZC will inform the aircrew of the reason and should coordinate any further action.

2.13.6.4. During airborne operations, the ground forces commander may need to determine the number of personnel who did not jump (alibi jumpers) to properly account for all personnel. When requested by the DZSO/DZ Support Team Leader (DZSTL), if the tactical situation permits, the DZC obtains the total number of jumpers remaining on board from the aircrew. This should not be accomplished until after the last aircraft over-flies the DZ and at no time if it compromises safety or conflicts with aircrew or DZC duties. Should such a conflict occur, delay or cancel transmissions accordingly.

2.13.7. Unauthorized Relays. Radio calls to determine order of flight, load information, and administrative details are normally not authorized.

2.13.8. Only qualified DZ personnel will operate DZ communication equipment.

2.14. Control Point Location. The DZC establishes the control point taking into account pertinent factors such as an unobstructed line of sight, winds, positive control of the DZ, surrounding airspace, and security requirements. Safety factors must always be considered when choosing a control point location. During actual IMC, HVCDS or HAARS, locate the control point off the DZ. The control point for multi-ship HE and all CDS equipment airdrops will be offset a minimum of 300 yards (HE) and 200 yards (CDS) from the intended PI.

2.15. En Route and Terminal NAVAIDS. A variety of electronic NAVAIDS are available to support assault zone operations including the TACAN, ZM, or radar beacons. These NAVAIDS are utilized at the discretion of the JFACC, COMAFSOF, or mission commander.

2.15.1. For airdrops, the normal placement for NAVAIDS is as follows:

2.15.1.1. The ZM (TPN-27) should be placed within 1500 yards of the PI. For maximum accuracy, the ZM should be as close to the PI as possible. If line-of-sight considerations preclude placement of the ZM at the briefed location, relocate it and advise the aircraft on initial contact of the new location relative to the PI.

2.15.1.1.1. During night airdrop operations, the ZM should be visually marked with a light to identify it as a hazard to parachutists and to prevent accidental destruction of the ZM by vehicular traffic.

2.15.1.2. Radar Beacon Operations. C-130 aircraft require a collocated pair of tuned I-band (SST-181) beacons and C-141 aircraft require only one beacon for radar beacon airdrops. Refer to Joint Pub 3-08.2, "Joint Tactics, Techniques and Procedures (JTTP) for Ground Radar Beacon Operations (J-Beacon)".

2.15.1.2.1. For CARP airdrops, compute the wind drift distance for the load being dropped and displace the beacons the computed distance and direction into the wind from the PI.

2.15.1.2.2. For MFF airdrops, the beacons will be placed on the PI.

2.15.1.2.3. The TACAN should not be placed on a DZ as an airdrop aid.

2.16. Ground Marked Release System (GMRS). When controlling an airdrop, the DZC can mark a point on the ground with a visual signal to designate the computed Release Point (RP) to the aircrew. This signal may be a four marker "L", six marker "T", or seven marker "H" and is placed abeam, and 100 meters (110 yds.) left of the desired release point as depicted in figure 2.11. The drop is executed when the aircraft is directly abeam, and 100 meters (110 yds.) right of this marker on the pre-briefed inbound heading. A pre-briefed code signal or beacon may be collocated with the markers to aid in DZ identification.

2.16.1. Marking Considerations:

2.16.1.1. The DZ markings must be clearly visible to the aircrew on approach as early as possible. If conditions preclude placing the markings at the computed point, the DZC may have to adjust the location of the intended PI, ensuring compliance with requirements in figures 2.1., 2.2., 2.5., 2.8.,2.9., and 2.10.. Advise both the aircrew and user of the change in PI location.

2.16.1.2. When conducting operations requiring security, night DZ markings should be visible only from the direction of the aircraft's approach. If flashlights are used, they should be equipped with simple hoods or shields and aimed toward the approaching aircraft. Omni-directional lights, fires, or improvised flares may be screened on three sides or placed in pits with the sides sloping toward the direction of approach.

2.16.1.3. During daylight airdrops, the marker panels should be slanted at a 45-degree angle from the surface toward the aircraft approach path to increase the aircrew's ability to see them. If security permits, smoke (other than red) may be displayed at the release point or corner marker to assist in aircrew DZ acquisition.

2.16.1.4. After selecting the DZ, calculate the dispersion distance, as stated below, and then select a PI that is compatible with the calculated point and the tactical situation. Once the PI has been determined, calculate the forward travel distance and wind drift effect to determine the release point.

2.16.1.5. Dispersion distance is defined as the total distance within the impact area where troops or cargo will land. It is in a direct line with the aircraft's line of flight and is dependent upon aircraft speed and load exit time (the length of time required for the first through the last object to clear the aircraft). The formula for calculating dispersion is; ¾ S x E = L, where S = aircraft speed in knots, E = exit time in seconds, and L = length of dispersion in yards. This figure is normally used to help in placing the PI, rather than determining the release point.

2.16.1.6. Wind drift is defined as the lateral movement of a parachute through the air caused by the wind. The distance of the wind drift is measured on a direct line from the parachute's fully deployed opening point to its actual point of impact on the ground. This drift is calculated using the formula; D = KAV, where D = drift in yards, K = the load drift constant, A = drop altitude in hundreds of feet) i.e., (1000 feet = 10), and V = wind velocity in knots. Figure 2.12. shows the constants for different airdrop loads.

2.16.1.7. Forward travel distance is the distance along the aircraft flight path traveled by a parachutist or cargo container after exiting the aircraft, until the parachute fully opens and the load is descending vertically (see figure 2.13.).

2.16.1.8. Offset is defined as the distance the aircraft will fly to the right of the marker (100 meters), so the markers will remain visible to the aircrew.

2.16.2. GMRS marking placement procedures:

2.16.2.1. Stand on the PI facing directly into the wind.

2.16.2.2. Pace off into the wind the distance calculated for wind drift.

2.16.2.3. Face toward the direction from which the aircraft will approach (reciprocal of DZ axis).

2.16.2.4. Pace off the distance calculated for forward travel distance. This is the actual release point.

2.16.2.5. Turn 90 degrees to the right and pace off 100 meters (110 yards for the offset). Place the corner or first panel at this point.

2.16.2.6. Establish the ground markings as shown in figure 2.11.

2.17. Verbal Initiated Release System (VIRS). ST personnel use this procedure when normal drop procedures are not tactically feasible. The ground party determines the desired release point, gives verbal steering guidance to the pilot to align the aircraft over that point, and then initiates the release. Instructions transmitted to the aircraft must be concise.

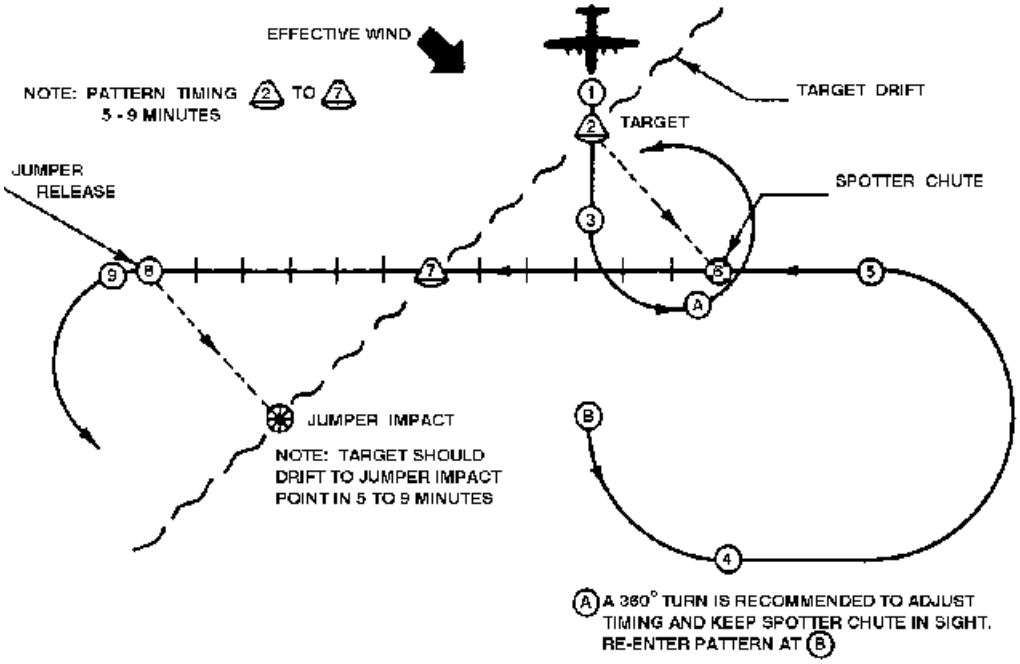
2.17.1. Transmit “Turn Left” or “Turn Right” to align aircraft on desired inbound heading.

2.17.2. Transmit “Stop Turn” after alignment instructions when aircraft is on course.

2.17.3. Transmit “Standby” to the aircraft approximately 10 seconds prior to the release point.

2.17.4. Transmit “Execute, Execute, Execute” when the aircraft reaches the release point. Upon hearing the first "Execute", the navigator calls "Green Light".

Figure 2.10. Jumpmaster Directed Airdrop, Moving Target Procedures.



1. MOVING TARGET PROCEDURES

a) Head directly toward the target, regardless of the wind direction.

b) Release the spotter chute or wind drift indicator (WDI) directly over the target.

c) Immediately upon release, make a left/right hand turn to observe the descent and position of the spotter chute/WDI.

d) Establish rectangular drop pattern oriented so the final approach will be aligned with the spotter chute/ WDI and the target, respectively. The pattern should be adjusted so that the aircraft will be over the target five to nine minutes after the spotter chute/WDI is deployed.

e) Turn on approach. Make minor changes in heading to pass over the spotter chute/WDI and the target on a direct line. Aircraft drift correction should be established prior to passing over the spotter chute/ WDI. Initiate a uniform count over the spotter chute/WDI.

f) Reverse count over the target.

g) Deploy jumpers when the last digit in reverse count is reached.

h) After the jumper clears the aircraft, turn to observe the accuracy of the drop.

i) Deploy additional jumpers using the drop heading and count established in steps 5, 6, and 7.

j) Disregard the spotter chute/WDI for subsequent passes.

k) When the target drift rate is changed (drogue chute is installed on target, no wind shift occurs, etc.) the entire spotter chute/WDI procedure must be re-accomplished and a new drop heading and count established starting with step 1.

2. MOVING TARGET PATTERN. Deployment procedures to a moving target are similar to those employed for a stationary target. The moving target procedures takes into consideration target drift and will place the team on the downdrift line of the moving target and not necessarily on target. Special attention should be paid to the following items:

(a) The pattern must be adjusted so that the initial pass over the target after spotter chute/WDI deployment is not less than 5 minutes and not more than 9 minutes, 7 minutes being ideal. If the initial pattern requires more than 9 minutes, the team will be too far downdrift/downwind and with a high target drift rate may not be able to locate the target visually.

(b) On the initial pass after the spotter chute/WDI deployment, an accurate count can be obtained by the JM and the heading noted

by both the JM and pilot. All subsequent passes will be made on this initial heading using the count obtained on the first pass. No attempt should be made to recheck the count or change the initial heading because the target will have drifted.

NOTE: On subsequent passes requiring a change of heading to place the aircraft over the target, insure the pilot corrects back to original heading. Moving target procedures are normally conducted from fixed-wing aircraft.

Figure 2.11. GMRS Day and Night Markings.

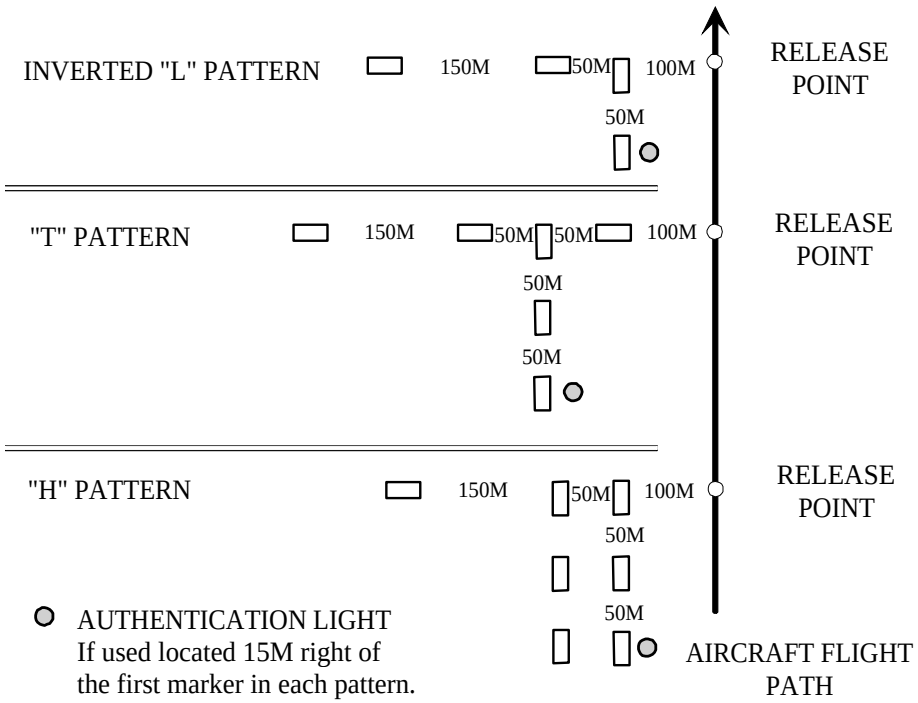


Figure 2.12. GMRS Load Drift Constants.

TYPE DROP	CONSTANT
Personnel	3.0
Heavy Equipment	1.5
CDS	1.5
Door Bundle	1.5
SATB	2.4

Figure 2.13. GMRS Forward Travel Distance Data.

TYPE DROP	C-130	C-141
Personnel	250 yds. (230m)	250 yds. (230m)
Heavy Equipment	500 yds. (459m)	730 yds. (670m)
CDS	550 yds. (505m)	750 yds. (688m)
Door Bundle	250 yds. (230m)	250 yds. (230m)
SATB	160 yds. (148m)	160 yds. (148m)

2.18. DZ Personnel.

2.18.1. DZ Controller (DZC).

2.18.1.1. The DZC is normally a USAF ST combat controller (E-4 or above with a five skill level or higher) certified by the unit commander. Combat controllers are authorized to control all airdrops for any US or allied military force. *NOTE:* Pararescue personnel are authorized to act as DZC for unilateral AF and foreign national pararescue operations in which pararescue is the controlling agency. DZC training and certification for rescue parachute deployments may be accomplished by qualified pararescue trainers/task certifiers and certified by letter by the unit commander.

2.18.1.2. Other DoD Authorized DZC Personnel.

2.18.1.3. U.S. Special Operations Command (USSOCOM) units. In addition to Air Force ST units, the following USSOCOM units have qualified personnel that may perform DZC duties during joint and unilateral training.

2.18.1.3.1. U.S. Navy Sea Air Land teams (SEAL) and Explosive Ordinance Disposal (EOD).

2.18.1.3.2. U.S. Army Special Forces (SF) and Rangers.

2.18.1.4. Drop Zone Support Team (DZST) Personnel.

2.18.1.5. U.S. Army / Marine Corps DZST personnel may perform DZC duties during joint and unilateral Air Force training airdrops.

2.18.1.6. DZSTs are qualified IAW the Memorandum of Agreement (MOA) "Airdrop Operations Without Air Force Combat Control" and unit standard operating procedures implementing this MOA.

2.18.1.7. DZST controlled missions must have a qualified Drop Zone Support Team Leader (DZSTL) in charge of DZ operations.

2.18.1.8. U.S. Air Force other than ST personnel.

2.18.1.8.1. Theater Airlift Liaison Officers (TALO). TALOs qualified IAW AMCI 13-101, *AMC Theater Airlift Liaison Officers,* may perform DZC duties during joint and unilateral airdrops.

2.18.1.8.2. AF Commanders may certify active duty, ANG, and AFRC members to perform DZC duties during unilateral training airdrops. It is highly recommended commanders utilize air operations oriented personnel to act as DZCs. Although not all encompassing, aircrew, air traffic control, aerial delivery support, pararescue, and jumpmasters (currently on jump status) are some of the AF specialties/qualifications that are routinely involved in air operations. See MAJCOM guidance for additional DZC eligibility and restriction criteria. Individuals may be certified after completion of the required training listed in paragraph 2.18.1.8.3. below.

2.18.1.8.3. Air Force DZC Training Requirements. All Air Force DZCs, other than combat control personnel and TALOs, will be trained to attain proficiency (minimum of 4 hours classroom and 2 hours practical training). Training will cover DZC responsibilities, duties, and DZ establishment as outlined in this publication and operations support squadron-training procedures. DZC instruction will be conducted by a qualified combat controller, DZC certified rated officer aircrew member (including TALOs), unit certified DZC personnel, or a sister ser-

vice DZST process IAW 2.18.1.6. Certification will be validated by letter, signed by the operations group (OG) commander and maintained at the group tactics office. Air Force aircrew members functioning as DZCs are restricted to a 12-hour duty day, waiverable to 16 hours by OG/CC or higher (not applicable to AFRC crewmembers).

2.19. DZC Responsibilities.

2.19.1. The DZC represents the appropriate commander as provided in the mission directive.

2.19.2. The DZC ensures that adequate medical and evacuation coverage is available prior to personnel airdrops when a DZSO is not required.

2.19.3. The DZC observes and evaluates:

2.19.3.1. All factors that may adversely affect the safety of the operation and ensures transmission of weather information when required.

2.19.3.2. Condition of the DZ prior to the airdrop.

2.19.3.3. Placement of personnel and equipment on the DZ. Only designated vehicles and personnel will remain on the DZ. Recovery and medical personnel and equipment must be positioned so that constant contact is maintained with the DZC. During joint operations, the DZC and the DZSO are responsible for their respective equipment and personnel.

NOTE:

For actual equipment or personnel airdrops, if the ceiling is less than 600 feet, direct all personnel and equipment off the DZ to ensure safety.

2.19.3.4. The operation of other aircraft which could endanger the drop aircraft, equipment load, or parachutists.

2.19.3.5. The DZC should have immediate access to ground-to-air communications equipment or sufficient signaling aids to operate the DZ. Ground-to-air communication is required for IMC airdrops.

2.19.3.6. The DZC denies the use of red smoke, red flares, signal lights, or DZC radios to non-DZC personnel.

2.19.4. In the event conditions are unsafe for airdrop operations, the DZC ensures that:

2.19.4.1. "No Drop" signals are displayed on the DZ.

2.19.4.2. "No Drop" or drop cancellation information is transmitted to the aircraft (see paragraphs 2.13.4 and 2.13.5.).

2.19.4.3. A drop is canceled when advised by the DZSO. During a joint mission, the DZSO is responsible for evaluating the winds and surface conditions for an airdrop operation. When only AF personnel are involved, it is the responsibility of the DZC to cancel the airdrop when conditions are unsafe.

2.19.4.4. Ensures necessary reports are prepared.

2.19.4.5. Authorized personnel other than qualified combat controllers performing DZC duties are restricted to formation airdrops of four or less aircraft unless on a military range with active range control.

2.20. DZ Safety Officer (DZSO). During training operations, the airdropped force furnishes the DZSO who in turn is responsible for the following functions (DZC/DZSO duties may be combined during unilateral AF operations):

2.20.1. Ensuring adequate medical coverage is available at the DZ prior to any joint service personnel drops. The supported unit normally provides medical coverage for itself and Air Force parachutists during joint operations.

2.20.2. Clearing the DZ of all personnel and equipment not required for control.

2.20.3. Determining when surface conditions (i.e., winds, vehicles, etc.) on the DZ are hazardous to airborne operations, making the decision to proceed with, suspend or cancel airdrops, and informing the DZC not later than 2 minutes prior to the drop. Airdrops are not suspended or canceled based solely on aircraft alignment with the DZ.

2.20.4. Coordinating all no-drop actions with the DZC.

2.20.5. Ensures the conditions of the DZ will not affect operations or recovery of air items.

2.20.6. Ensures the DZ meets operational and safety criteria for the type airdrop operations being conducted.

2.21. DZ Scoring.

2.21.1. Scoring Procedures. Drop scoring is the responsibility of the DZC.

2.21.2. Strike Reports. The strike report reflects the circular error (CE) or the distance that the first object (or parachutist) lands from the PI. Strike reports are given in yards or meters and relative clock position from the PI with 12 o'clock as the relative DZ axis heading.

2.21.3. Score object impacting within a 25-yard radius of the PI as a "PI".

2.21.4. Score the accuracy of mass airdrops during joint training, exercises, SOF standardization / evaluations, and high velocity airdrops as "Satisfactory" if 90 percent or more of all airdropped personnel or equipment lands within the boundaries of the DZ. Score these drops as "Unsatisfactory" if less than 90 percent lands within these boundaries. Mass airdrops for personnel are considered approximately brigade size or larger. Both personnel and equipment airdrops may be scored using mass airdrop criteria if the accuracy is indeterminable.

2.21.5. MFF Airdrops. Do not score MFF airdrops. Annotate actual TOTs and information relevant to any mishap or off-DZ drops.

2.21.6. Scoring Methods. There are three methods to score airdrops. *NOTE:* Score only the first load / parachutist exiting from each aircraft.

2.21.6.1. Pacing. Score is measured by physically pacing the distance from the PI to the place where the parachutist or equipment load landed.

2.21.6.2. Estimating. Used when there is insufficient time or personnel to pace. The distance from the PI to the load is visually estimated. To assist in scoring by this method, markers (visible

from the PI) may be placed 300 yards from the PI at the 3, 6, 9, and 12 o'clock positions. If the markers are used, indicate this to the aircrew.

2.21.6.3. Measuring. The distance from the PI to the load is measured when precise scores are required. The distance is measured using a precision measuring device (odometer, pre-measured length of cord, measuring tapes, cyclometer, GPS, etc.).

2.22. Off DZ Reporting Procedures.

2.22.1. When an off DZ airdrop has been confirmed or suspected, the aircrew involved will not attempt another drop for the remainder of the mission. In the case of an off DZ drop involving injury or death to personnel, the mission will be terminated and the aircraft will land as soon as possible. Retain all paperwork involved in the flight to aid in the investigation. Aircrews will immediately report information regarding off DZ airdrops to Command Post. Unit safety offices will be notified as soon as possible. Off DZ mishaps, resulting in death or serious injury shall be referred to safety and accident investigation boards convened under the appropriate regulations.

2.22.2. Units with DZC/DZSO/DZST responsibilities will develop local procedures and communications processes to obtain emergency assistance to preserve life and limb, secure the site, and notify the airlift and user's chain of command. The first notification step should be through the airdrop aircraft for relay to a USAF command post. Alternative means may include relay through any local US military installation. Local installations may also be able to assist with emergency response resources including, crash/fire/rescue, law enforcement, and public affairs.

2.22.3. OG commanders or equivalents shall appoint an aerial delivery review panel to investigate all off DZ airdrops. Panel members should include the chief of tactics (chairperson); tactics pilot, navigator, and loadmaster; stan/eval pilot, navigator, and loadmaster; airdrop inspector loadmaster, flying safety officer, and crewmembers from the incident. The chairperson will determine panel composition based on the nature of the situation under review.

2.22.4. The Flying Safety Officer will determine if the airdrop incident is reportable in accordance with AFI 91-204, *Safety Investigation and Reports*. The aerial delivery review panel will be prepared to provide information requested for a safety investigation and report, if warranted. Normally, the Air Force reports injuries and damage to their own personnel and equipment. Other military services report injuries and damage to their own personnel and equipment. The Air Force takes part in these investigations when requested by the other service.

2.22.5. Convene an aerial delivery review panel no later than the next duty day after the airdrop if the incident occurs in the local area. If the incident occurs away from home station, convene the panel within 5 duty days (10 days for ANG and USAFR units) after the aircrew returns to home station. Unit commanders will ensure aircrew members involved in an off DZ airdrop are not scheduled for any event that would delay convening an aerial delivery review panel or for another airdrop until the incident is resolved. Upon completion of the aerial review panel, the chairperson will submit recommendations to the Operations Group Commander. The OG/CC will make the final determination regarding any panel recommended actions.

2.22.6. HQ AMC/DOKT will be the repository for all Air Force off DZ reports. AMC units will send the results of their delivery review panel by memorandum, message, or e-mail to HQ AMC/DOKT within three duty days after the panel convenes. Non-AMC units will forward their report to AMC/DOKT through their MAJCOMs. If the aerial delivery review panel judges the incident to be of

immediate interest to other airdrop units, send an immediate message outlining significant details and recommendations to HQ AMC/DOKT with an information copy to the parent numbered Air Force (NAF).

2.22.7. As a minimum, the delivery review panel results will include the following information in their final report, and in the following format: Date of incident, type aircraft, unit, type load, DZ name and location, type drop (SKE, Visual, or Computer Drop), day/night, formation position, drop score (clock position and distance), and surface winds. The report will also include causes and recommendations. After collecting all Air Force off DZ reports, HQ AMC/DOKT will provide a yearly off DZ Crosstell Report. This report will be due to AMC/DO by 31 Jan every calendar year.

2.23. DZ Surveys.

2.23.1. USAF aircraft require a DZ survey for training airdrop missions involving US personnel and/or equipment. Completing the DZ survey process involves both a physical inspection of the DZ, and documenting the information on AF Form 3823, **Drop Zone Survey**. Surveys may be accomplished by the using units. The using unit is defined as the unit whose equipment or personnel are being airdropped. For exercises and joint training operations, users must ensure the survey is completed and meets the appropriate criteria for operational and safety standards. The user must conduct a physical inspection of the DZ prior to use to identify and evaluate potential hazards to airdropped personnel/equipment, man-made or natural structures, and ground personnel. The regional / wing tactics office or designated individual will perform the safety-of-flight review to ensure there are no obstructions prohibiting over-flight. If a DZ survey is done on an existing surveyed DZ to meet new run-in axis requirements for a particular mission, only a safety-of-flight review is required.

2.23.1.1. Host Nation (HN) DZ Surveys. When dropping HN military jumpers and/or equipment on a HN surveyed DZ, the mission can be performed using only a safety-of-flight review (see 2.23.1.2 below) of the HN survey. Users remain responsible for ground operational and safety criteria IAW 2.23.1 above. However, when US personnel and equipment are airdropped, HN surveys will not be used in lieu of a survey completed by US forces IAW survey procedures outlined in paragraph 2.23.

2.23.1.2. Safety-of-Flight Review. A safety-of-flight review is completed by an airdrop qualified pilot or navigator on all DZ surveys. The purpose of a safety-of-flight review is to ensure an aircraft can safely ingress and egress the DZ. A safety-of-flight review includes an in-depth chart study of the terrain features along the route of flight from the IP to a distance of approximately 4 nautical miles past the DZ trailing edge.

2.23.1.3. A 1:50,000 scale chart should be used when available for the objective area and at least a 1:250,000 scale chart for the run-in and escape. The safety-of-flight review lists all obstructions such as terrain, towers, or power lines that may affect the aircraft's ability to achieve drop altitude and airspeed. Also listed on the safety-of-flight review are any prohibited areas such as noise sensitive areas, special use airspace, preferred routing, Notice to Airmen (NOTAM) requirements, etc. Additionally, the safety-of-flight review considers the ability of the aircraft to fly over the DZ at slow speeds and escape from the DZ, using three-engine climb out rates. If these criteria cannot be met, the run-in must be modified, drop altitude raised, or the safety-of-flight review denied.

2.23.2. When conducting operations on a DZ that was previously surveyed by another unit, the commander of the using unit is responsible for ensuring the DZ meets the criteria for that operation. In all

cases, the using unit must accept responsibility for all personnel injuries, parachute or load damage, and property damage which occurs on the DZ.

2.23.3. Tactical DZ Surveys. During exercises and contingencies, when time or situation do not permit completion of a full DZ survey, a tactical DZ survey may be required to support highly mobile ground forces.

2.23.3.1. Though preferable, the use of an AF Form 3823 is not required for a tactical survey. Requests and surveys may be passed electronically. As much information as practical should be obtained and forwarded for review.

2.23.3.2. Requests for tactical surveys will be forwarded to the designated exercise / contingency airlift or special operations airlift component senior representative for final review.

2.23.3.3. When using a tactical DZ, the airlift unit assumes responsibility for aircraft safety-of-flight and the receiving unit assumes responsibility for injury to personnel or damage to equipment / air items. The DZ size should be determined by the mode of delivery, load dispersal, and discussion with receiving unit regarding air item recoverability and load survivability.

2.23.4. Parachute Demonstration Team DZ Surveys. The Air Force "Wings of Blue, "Special Tactics And Rescue Specialists (STARS)", and MAJCOM sponsored parachute demonstrations do not require a formal DZ survey for public affairs coordinated high altitude low opening (HALO) precision parachute demonstrations using Air Force aircraft. It is the responsibility of the demonstration team leader / jumpmaster to ensure all service, FAA, and hosting organization requirements are met on and around the DZ. It is the responsibility of the flying unit to ensure flight safety will not be compromised and that applicable NOTAMs are filed with the FAA. It is the responsibility of both the flying unit and the demonstration team leader / jumpmaster to ensure all aspects of the planned operation are well briefed and understood by all parties involved.

2.24. DZ Review Process. The following paragraphs outline the DZ review process from performing the initial groundwork to the final incorporation of the DZ into the assault zone database and AZAR. The AZAR is a comprehensive listing of assault zones in the assault zone database available for use by the DoD. Use of the AZAR will expedite mission planning, enhance safety, and avoid duplication of surveys. Information in the AZAR does not replace the need for a completed survey prior to conducting assault zone operations. All completed surveys will be forwarded by the appropriate agencies to HQ AMC/DOK for inclusion in the worldwide assault zone database. ***NOTE:*** Surveys do not have a defined shelf life or expiration date. The user must conduct a physical inspection of the DZ prior to use (IAW 2.23.1.) and aircrews review safety of flight requirements during mission planning. Surveys will be reaccomplished when the user and/or airlift provider determines changes in the ground or air aspects of the DZ data require a new survey.

2.24.1. The surveyor (AF Form 3823, item 4a) performs the actual ground portion of the DZ survey (i.e., measurements, coordinates, calculating size, obtaining maps and creating diagrams) and annotates results on the AF Form 3823. The surveyor may be a member of the unit that intends to use the DZ. A member of another unit may perform the ground portion of a survey if requested and time permits. For example, a USAF member may perform the ground survey for an Army unit and vice-versa. To facilitate future use of surveyed DZs, initial surveys will encompass the largest area available and will not be limited by specific mission requirements. The surveyor will forward the completed survey to the ground operations review authority (see paragraph 2.24.2.) with a transmittal letter. Include

recommended use, any deviations from DZ standards contained in service or MAJCOM directives, and other pertinent remarks. Throughout the review process, DZ survey packages will include all applicable maps, photos, charts and diagrams necessary to determine the safety and utility of the DZ.

2.24.2. The ground operations review authority (AF Form 3823, item 4c) is normally the surveyor's commander or designated representative. This review ensures the survey form is complete, accurate, and the DZ meets the criteria for planned airborne operations.

2.24.3. The safety-of-flight reviewer (AF Form 3823, item 4d) performs the safety-of-flight review ensuring that the DZ can be safely used from a flight perspective.

2.24.4. Air Operations Approval. (AF Form 3823, item 4e). Prior to use, surveys will be approved for air operations by the appropriate OG Commander. This approval assures that the safety of flight review has been accomplished and the DZ is considered safe for air operations.

2.24.5. Once item 4e of the AF Form 3823 is completed, the survey is ready for use. Forward copies of the survey to HQ AMC/DOK, 402 Scott Drive, Scott AFB IL 62225-5320, to maintain the most current data in the AZAR database.

2.24.6. Assault zone surveys document the conditions that existed at the time the survey was accomplished. Recommended uses may be based on minimum requirements and should not be misconstrued to be all inclusive; (i.e., a DZ recommended for personnel may be suitable for a single parachutist but not for 15, or it may be suitable for a C-130 but not a C-141). It is the responsibility of the airlift and ground units involved to ensure that any DZ being considered for use meets the requirements for their specific operation.

Chapter 3

ALZ OPERATIONS

3.1. General. There are two types of airland operations that provide transportation within a theater or joint operations area. Routine air movement is usually unopposed and uses secure airfields or well-established ALZs; the majority of these missions involve the administrative airlift of troops and equipment. Certain phases of any airlift operation, or the entire operation, may be accomplished by airlanding troops and equipment directly into the objective area. ST forces, composed of combat control, pararescue, and combat weather personnel, normally provide assault zone assessment, combat weather forecasting, and austere airfield control for ALZs used in direct delivery and tactical theater airlift operations.

3.2. ALZ Responsibilities. The airlift mission commander selects the air tactics and designs the flow of air movement to comply with the delivery requirements. The airlift mission commander establishes control through combat control of all air traffic movement (traffic pattern, landing, taxi, parking, and takeoff) at Air Force operated ALZs.

3.3. ALZ Selection. The DIRMOBFOR, through the component commanders, and the joint force engineer determine the most suitable locations. The selected sites must meet AF operational requirements, ground component requirements, and construction requirements. Desirable characteristics of ALZs are ease of identification from the air; a straight, unobstructed, and secure approach for aircraft; and close proximity to ground objectives. ALZs to be developed into more sophisticated facilities should have the following additional characteristics:

Area of sufficient size to accommodate the number and type of aircraft to be landed

Parking and dispersal area for optimal useA road net to handle ground vehicular traffic

Minimum construction and maintenance needs

Areas and facilities for air terminal operations

Sufficient aerial port capacity to handle incoming personnel and supplies

Facilities to support crash and rescue vehicles

3.4. ALZ (ALZ) Classification. The following general data is intended to correlate the Army airfield classification system with the Air Force classification system. The correlation of these airfields may not be exact and specifications are dependent upon aircraft gross weight, utilization of aircraft arresting equipment, criteria for the particular instrument approach planned, and model and type of aircraft.

3.4.1. Air Force airfields are usually constructed to standards that are based primarily on the expected life of the airfield.

3.4.1.1. Expedient airfields are those surfaced with dirt, membrane, landing mat, or any combination of these.

3.4.1.2. The criteria in AFJPAM 32-8013, Volume II (FM 5-430-00-2) *Planning and Design of Airfields and Heliports in the Theater of Operations*, outlines construction criteria of airfields for aircraft operating under normal conditions and procedures. Combat control personnel are trained to perform tactical ALZ surveys or assessments in support of airlift operations. They determine

ALZ suitability by using general criteria in AFJPAM 32-8013, Volume II (FM 5-430-00-2), and the specific tactical ALZ criteria contained in MAJCOM supplements to this instruction. Figure 3.1 shows the general peacetime minimum sizes for various USAF fixed-wing assault ALZs. These ALZs are based upon required use of assault landing/maximum effort take-off procedures by arriving/departing aircraft. These procedures are defined by applicable aircraft operating manuals.

3.4.1.3. Airfield construction is generally done following the guidelines in AFJPAM 32-8013, Volume II (FM 5-430-00-2). However, criteria to be utilized in a specific theater of operations is based on local conditions and determined by Army and Air Force staff engineers acting for the joint force commander. NOTE: AFJMAN 32-8013 will replace this and several other airfield construction references.

Figure 3.1. Minimum Airfield Criteria.

		Width (Ft) (Note 1)		
Type AC	**Length (Ft) (Note 1)**	**No Turn Required**	**180 Degree Turn (Normal)**	**180 Degree Turn (3 Point)**
C-130	3,500 (Note 2)	60	60	50 (Note 3)
C-17	3,500 (Note 2)	90	143	80 (Note 3)
C-141	6,000 (Note 4)	98	138	N/A
C-5	6,000 (Note 4)	150	150	N/A
MC-130	3,000	60	60	50
M/HC-130 NVG	3,500	60	75	N/A
C-130 NVG	3,500 (Note 2)	60	75	N/A
C-141 SOLL II	5,000	98	150	N/A
C-5 SOLL II	5,000	98	150	N/A

Notes:1. Minimum operational criteria without a waiver during peacetime operations.
2. Peacetime restriction. Runways less than 3.500 ft. require a waiver from the MAJCOM/DO or designated representative.
3. Does not include any safety margin. Increase by 10 feet for routine operations.
4. Waiverable to 5,000 feet by NAF/DO.

3.4.2. Potential ALZ areas fall into three basic categories: unprepared, semi-prepared, and surfaced. Unprepared surfaces are natural areas such as deserts, dry lakebeds, and flat valley floors. Semi-prepared surfaces are short airstrips that have been constructed for a limited use and may or may not have an aggregate surface. Surfaced areas may include existing airfields, roads, highways, or other paved surfaces.

3.4.3. ST units are equipped with total station and clinometers to check approach zone clearance. ST forces are also equipped with airfield or dynamic cone penetrometers are used to check weight bearing capability of unsurfaced ALZs.

3.4.4. Combat control personnel are not qualified to evaluate hard surface pavements for traffic cycles and weight bearing.

3.4.5. Combat control personnel are not qualified to perform engineering surveys. They may be required to assist the airlift commander as a designated representative in selecting ALZ sites.

3.4.6. Existing or proposed airfields that require precise determination of gradients should be surveyed by engineering teams using appropriate survey equipment.

3.4.7. Semi-permanent runways are usually surveyed by engineering units and do not require a survey by a ST unit. However, semi-permanent and permanent installations, such as captured enemy airfields, must be assessed for possible aircraft hazards and correct dimensions prior to use. ST units may be tasked to perform this type of assessment using criteria outlined in paragraph 3.4.1.2. above.

3.4.8. The ST unit gathers data from the on-site survey, prepares an ALZ survey package using the AF Form 3822 **Landing Zone Survey**, and recommends approval or disapproval to the appropriate agency for use.

3.4.9. During the survey process, if there is any potential for impact or damage to the environment due to the construction or modification of new or existing ALZs, follow the procedures within AFI 32-7061, *The Environmental Impact Analysis Process*.

3.5. General ALZ Criteria. ST units may be required to assist in selecting ALZs. General guidelines are available in AFJPAM 32-8013, Volume II (FM 5-430-00-2). Specific tactical ALZ criteria for the type aircraft involved are contained in applicable MAJCOM supplements to this instruction. For informational purposes only, the following general data applies to ALZ criteria:

NOTE:

AFSOC ST units will use Air Force Civil Engineering Support Activity (AFCESA) ETL 98-5, Criteria and Guidance for C-17 Contingency and Training Operations on Semi-Prepared Airfield. The revised ETL is published for immediate implementation. ST Commanders will insure their personnel are fully briefed on the guidelines for C-17 contingency and training operations on semi-prepared airfields based on this ETL. An electronic copy of the ETL is available on the WWW. The file is 5.8 Meg compressed and 35 MEG unzipped (176 pages). The web site address is as follows: http://www.afcesa.af.mil/AFCESA/TechSupport/Energy/ETL/etl97-9.htm. Once you have accessed this page follow the on-screen instructions to download the desired file format. This procedure will remain in effect until the ETL criterion is incorporated into AFJPAM 32-8013. ETL 98-5 will replace the geometric criteria outlined in 97-9 when published. Contact Mr. Dick Smith, AFCESA, DSN 523-6084 for publishing date.

3.5.1. Size and terrain. ALZs should be of sufficient size to permit rapid takeoff, landing, and loading operations. Terrain may be of soil, dirt, sand, or another suitable surface. Consideration must be given to the slope and elevation of the runway, aircraft capability, taxiways, and loading restrictions including their ability to support aircraft weight. Criteria for the layout of newly constructed ALZs are listed in detail in AFJPAM 32-8013, Volume II (FM 5-430-00-2), Table 11-3. Figure 3.1. shows the general minimum sizes for various fixed-wing ALZs. For criteria that are more specific, see MAJCOM publications.

3.5.2. Environmental Impact Analysis. The proponent of the survey request (i.e., the requesting office, unit, or activity) is responsible for completing the AF Form 813, **Request for Environmental Analysis**. The Air Force uses AF Form 813 to document the need for environmental analysis of certain categorical exclusion determinations for proposed actions. This form helps narrow and focus the issues to potential environmental impacts.

3.5.3. Helicopter LZs (HLZ). HLZs are dependent on the aircraft type or size. See MAJCOM for HLZ procedures.

3.5.4. Soil Conditions. Before any short field training operations are scheduled from an unprepared strip, there must be a thorough investigation of soil conditions to determine whether the abrasive content could adversely affect aircraft operations. Whenever possible, the weight bearing capacity of the landing, taxiing, and parking areas must be determined. The weight bearing capacity is determined IAW AFJPAM 32-8013, Volume II (FM 5-430-00-2). Weight bearing capacity is not required for helicopter operations, but care must be exercised to ensure the HLZ is cleared to prevent possible engine damage or personnel injury from flying debris due to hover operations.

3.5.5. ALZ Surface Tolerances and Clearances. Tolerance or roughness will depend upon sheer strength, hardness, and size of items that cause roughness. Roughness interrupts smooth rotation of aircraft tires and interferes with marginal aerodynamic lift of flight control surfaces at slow speed. Location and frequency of surface crests or wave tops are of paramount importance. The following items may be used as a guide in determining suitability of runway surface, shoulders, and clear areas. Exceeding these limits may result in structural failures of the aircraft. Roughness must be minimized for sustained operations.

3.5.6. Traffic Area (Runway, Overruns, Taxiways, Parking Apron):

3.5.6.1. Rocks. Rocks in traffic areas must be removed, embedded, or interlocked with each other so aircraft tires will traverse the area without causing displacements.

3.5.6.2. Soil Balls (dried cohesive dirt clods). Soil balls or dry cohesive dirt clods (clay excluded) up to 6 inches in diameter that will burst upon tire impact are allowed. Hardened clay clods that have similar characteristics as rocks and exceed 4 inches in diameter must be pulverized or removed from the traffic areas.

3.5.6.3. Tree Stumps. Remove all stumps, fill holes, and compact soil to the California Bearing Ratio (CBR) of the surrounding surface.

3.5.6.4. Ditches. Eliminate ditches from traffic areas. When filled, the CBR must be that of the surrounding area.

3.5.6.5. Plowed Fields. Contours of dirt patterns established to reduce erosion, water drain-off, and for planting preparation which have been accomplished by agricultural plowing usually contain a soft core and normally will not require removal. However, such dirt patterns should be examined carefully to determine the need for removal.

3.5.6.6. Depressions and Soil Mounds. Depressions and soil mounds do not have sharp corners and are recognized as oval or circular gradual sinks or rises. Level or fill depressions or mounds that exceed 15 inches across the top and 6 inches in depth or height until they meet grade tolerance criteria.

3.5.6.7. Potholes. Potholes are circular or oval in shape and are distinguished from depressions by their smaller size and sharp corners. Potholes must be filled if they exceed 15 inches across their widest point and 6 inches in depth.

3.5.7. Shoulder. A graded and compacted area on either side of the runway to minimize the risk to aircraft of running off or landing off the runway. Shoulders should have tree stumps cut flush with the ground; rocks and objects, which could be ingested by engines or cause damage to the bottom of the

aircraft should be removed. Shoulders are normally 10 feet wide with a maximum positive or negative grade of 3%.

3.5.8. Graded Area (previously clear area). An area located adjacent to and outside of the runway shoulders. Grades may slope up or down to provide drainage, but may not penetrate the primary surface. The minimum grade is 2% and the maximum is 5%. Graded areas should not have any obstacles over 4 inches high except vegetation, runway edge markers, runway distance remaining markers, Mobile Aircraft Arresting Systems (MAAS), and/or other visual or electronic navigational aids which must be sited in this area due to their function. Width of graded area varies from 35 feet (10.7m) to 375 feet (114.3m) depending upon type aircraft the airfield is intended to support. Appropriate dimensions are contained in MAJCOM supplements to this instruction.

3.5.9. Clear Zone. A cleared area located at each end of the runway. Width is normally equal to runway, shoulders, and clear areas and length is normally 500 feet or 1,000 feet (152.4m or 304.8m).

3.5.10. Transitional Area (previously lateral safety zone). The normal width requirements are 60 feet (C-130), or 70 feet (C-17), extending outward from the graded area with a maximum positive slope of 10% and a maximum negative slope of 20%. Transitional areas should meet the criteria for the most restrictive type of aircraft using the ALZ.

3.5.11. Approach Zones. A trapezoidal area extending outward from each clear zone within which no object may penetrate the glideslope angle. Approach zones should meet the criteria for the type of aircraft using the ALZ. The normal clearance surface is established on a 35:1 ratio for C-130 operations and 20:1 for C-17 operations.

3.5.12. Overrun. A graded and compacted portion of the clear zone, located as an extension to the end of the runway. An overrun is normally not considered part of the usable runway when establishing airfield markings. Do not include overrun distances to calculate the available ALZ length required for operations. Overruns are used to minimize risk to aircraft due to overrun on takeoff or undershooting a landing. The width is normally equal to that of the runway and length is determined by the type of aircraft involved. See MAJCOM supplements to this instruction.

3.6. ALZ Markings.

3.6.1. ALZ Marking Equipment. ALZs are normally marked with VS-17 marker panels secured to upright supports for day operations and omni-directional visible lighting systems with a minimum output rating of 15 candela, and strobe lights if required, for night operations. The C-17 uses the visual assault zone marker panel (VAMP). Virtually any type overt lighting or marking system is acceptable, if all participating units are briefed, and concur with its use. ST units may also use specialized clandestine lighting systems.

3.6.2. ALZ Markings and Identification. Specific details must be determined concerning the type and location of ALZ markings as well as airfield identification procedures. Consider existing international agreements. ALZ markings and identification procedures must be briefed to all associated ground and aircrew members.

3.6.3. Airfield Markings. Utilize conventional or special operations ALZ markings consistent with flying safety. When landings can be anticipated at both ends of the ALZ, ensure touchdown areas are marked at both ends.

3.6.4. Airfield Marking Patterns (AMP). In general, there are four types of airfield marking patterns, designated AMP-1 through AMP-4. These correspond to the type airland mission being supported and are used to simplify mission tasking. The four types include:

3.6.4.1. Standard ALZ Markings.

3.6.4.1.1. AMP-1. Normally used to support day or night tactical airlift missions. See figure 3.2 for night markings and Figure 3.3 for day markings. These markings also implement STANAG 3601 and ASCC Air Standard 44/37C requirements. When using the AMP-1 pattern, aircrew mission planners are authorized to reduce or eliminate panel markings for well-defined runways during day VMC operations. As a minimum, the touchdown zone must be marked.

3.6.4.1.2. AMP-2. AMP-2 was formerly referred to as the reception party or "RCL" lighting pattern. When markings are established by ST units, covert lighting may be used. The safety zone is used for training purposes only and may be deleted for contingencies. See figures 3.4. and 3.5..

3.6.4.1.3. AMP-3. AMP-3 was formerly referred to as the "Box and One", and is now considered a standard lighting system. This lighting system may use overt or covert lighting equipment. The safety zone is used for training purposes only and may be deleted for contingencies. For AFSOC NVG landings, using the AMP-3 configuration, the box and one is for runway identification only. See figures 3.6. and 3.7..

3.6.4.1.4. AMP-4. AMP-4 was formerly referred to as the "Blacked Out ALZ." No markings are required.

3.6.4.1.5. For HLZ marking requirements, refer to MAJCOM publications.

3.6.5. Marking Considerations:

3.6.5.1. The ALZ markings must be clearly visible to the pilot as early on the approach as possible.

3.6.5.2. If security requires, night ALZ markings should be visible only from the direction of the aircraft's approach. If flashlights are used, they may be equipped with simple hoods or shields and aimed toward the approaching aircraft. Fires or improvised flares may be screened on three sides or placed in pits with sides sloping toward the direction of approach.

3.6.5.3. During daylight landings, marker panels should be erected upright, facing toward the aircraft approach, to increase the pilot's ability to see them. Marker panels and supports must be reasonably frangible to avoid excessive damage if struck by an aircraft.

3.6.5.4. Mark loading and taxi areas as determined during mission planning. For night operations, place suitable blue lights 500 feet apart on the straight portions and when possible, reflectors should be placed halfway between the blue lights. Light spacing may be reduced to 75 feet on curves and at corners or intersections.

Figure 3.2. Airfield Marking Pattern (AMP) - 1 (Night).

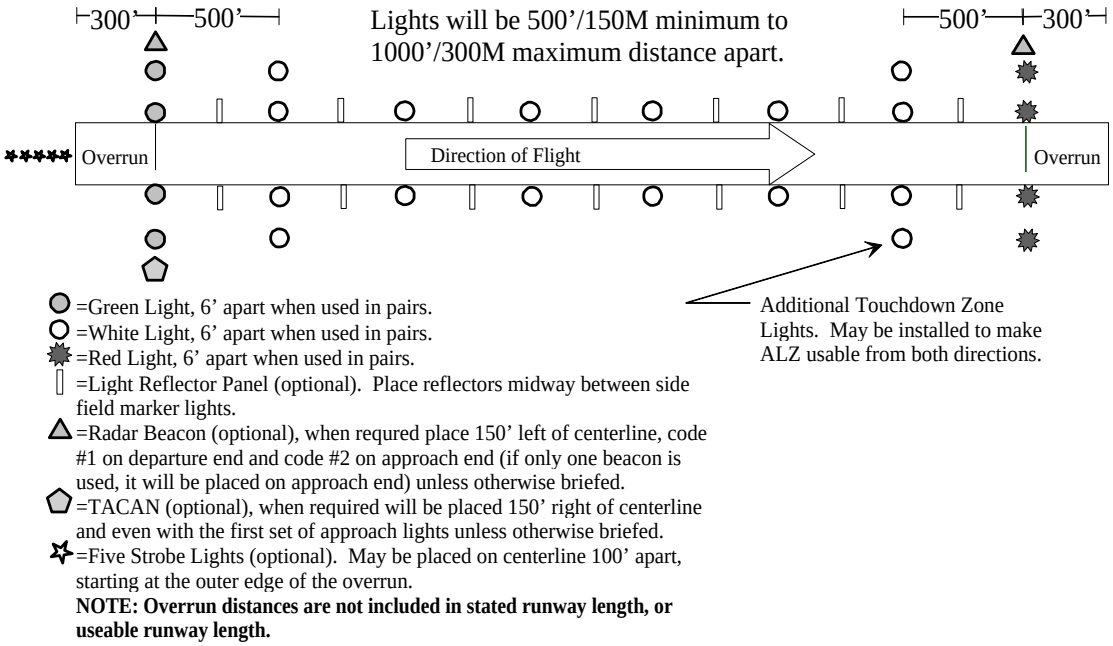


Figure 3.3. Airfield Marking Pattern (AMP) - 1 (Day).

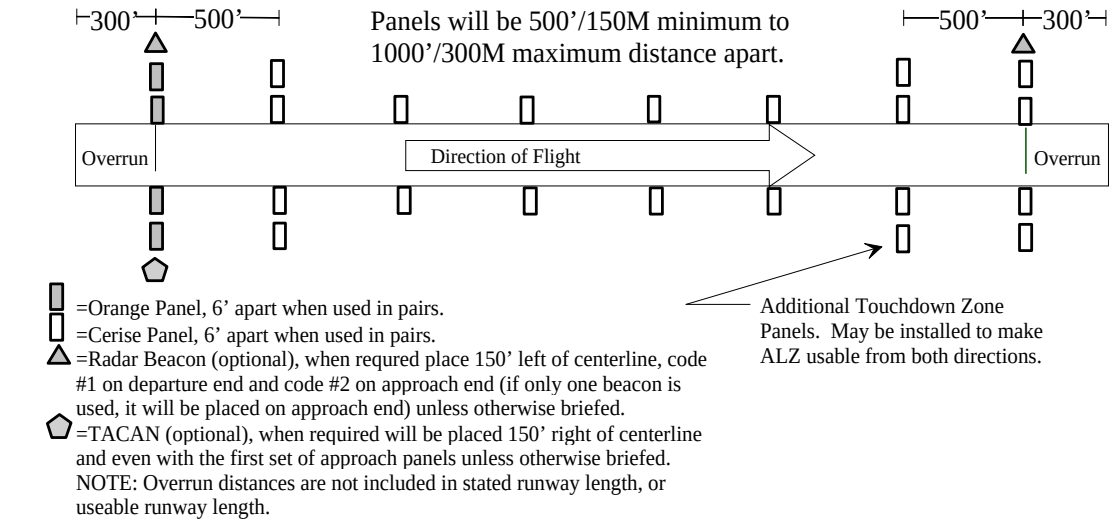
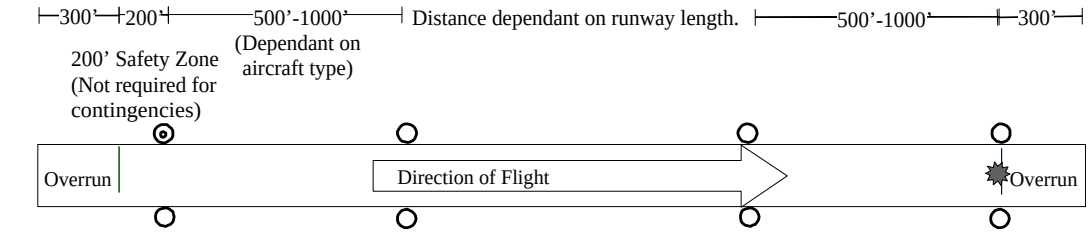


Figure 3.4. Airfield Marking Pattern (AMP) - 2 (Night).

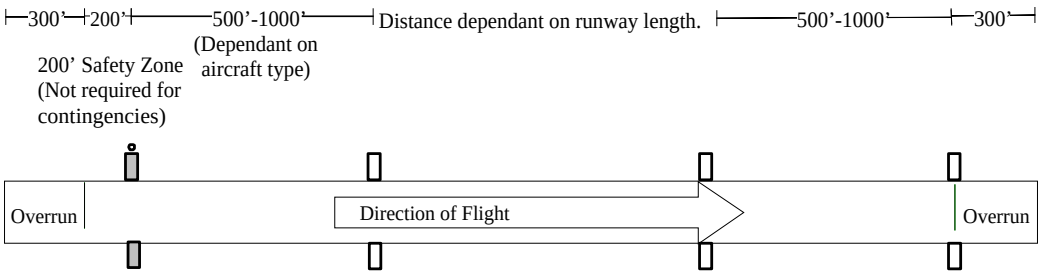


=Field Marker Light: May be overt or covert.
=Reception committe leader (RCL) signal station: Authentication, if used, will be at or adjacent this point.
=Flashing Strobe Light: Placed on centerline at the end of the usable runway or at a point that permist safe landing and takeoff (may be overt or covert).

For day operations, substitute panels for lights.

NOTE: Overrun distances are not included in stated runway length, or useable runway length.

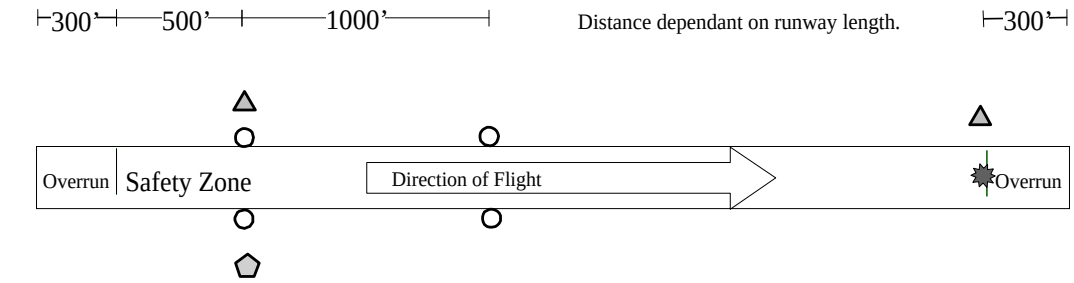
Figure 3.5. Airfield Marking Pattern (AMP) - 2 (Day).



=Orange Panel
=Cerise Panel
=Reception committe leader (RCL) signal station: Authentication, if used, will be at or adjacent this point.

NOTE: Overrun distances are not included in stated runway length, or useable runway length.

Figure 3.6. Airfield Marking Pattern (AMP) - 3 (Night).

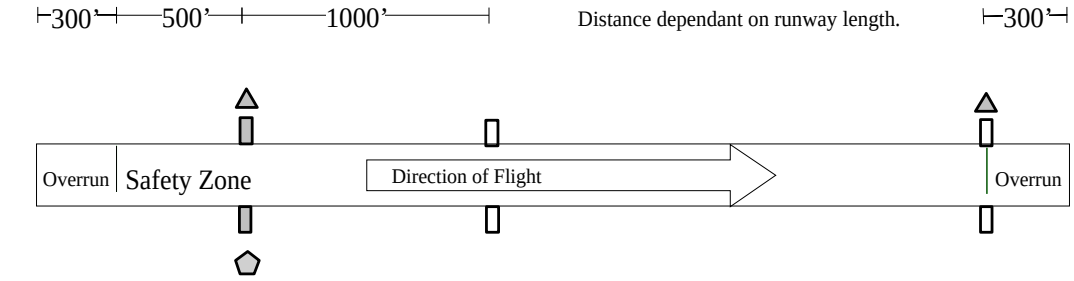


○ =Field Marker Light: May be overt or covert.
✸ =Flashing Strobe Light: Placed on centerline at the end of the usable runway or at a point that permist safe landing and takeoff (may be overt or covert).
△ =Radar Beacon (optional), when required place 150' left of centerline, code#1 on departure end and code #2 on approach end (if only one beacon is used, it will be placed on approach end) unless otherwise briefed.
⬠ =TACAN (optional), when required will be placed 150' right of centerline and even with the first set of approach lights unless otherwise briefed.

For day operations, substitute panels for lights.

NOTE: Overrun distances are not included in stated runway length, or useable runway length.

Figure 3.7. Airfield Marking Pattern (AMP) - 3 (Day).



▮ =Orange Panel.
▯ =Cerise Panel.
△ =Radar Beacon (optional), when required place 150' left of centerline, code#1 on departure end and code #2 on approach end (if only one beacon is used, it will be placed on approach end) unless otherwise briefed.
⬠ =TACAN (optional), when required will be placed 150' right of centerline and even with the first set of approach lights unless otherwise briefed.

NOTE: Overrun distances are not included in stated runway length, or useable runway length.

3.7. Emergency Signals. Standard air traffic control light signals are normally used if radio communications are not established. A go around may also be signaled by using either red flares, a red light beam aimed directly at the pilot, or a radio call to the pilot. See figure 3.8.

Figure 3.8. Standard Air Traffic Control Light Signals.

SIGNAL	AIRCRAFT ON GROUND	AIRCRAFT IN AIR
Steady Green	Cleared for Takeoff	Clear to Land
Flashing Green	Clear to Taxi	Return for Landing
Steady Red	Stop	Give way to other aircraft and continue circling
Flashing Red	Taxi Clear of Runway	Field unsafe-Do not land
Flashing White	Return to starting point	N/A
Alternating Red/Green	Use extreme caution	Use extreme caution

3.8. Communications. The ACC or COMAFSOF will determine communications requirements. Standard Federal Aviation Administration (FAA) radio procedures will be used unless otherwise briefed. The Assault Landing Zone Controller (ALZC) and Assault Landing Zone Safety Officer (ALZSO) are the only individuals authorized to communicate control instructions to aircraft operating near an ALZ (see pargraph 3.10. below).

3.9. Terminal NAVAIDS. ST units have the capability to tactically employ and operate a variety of NAVAIDS in support of ALZ operations. The units deploy NAVAIDS, such as the TACAN, ZM, mobile microwave landing system (MMLS) or radar beacons as directed by the Air Component Commander or COMAFSOF. Standard NAVAID placement procedures are listed below; however, the tactical environment will frequently require modifications of these standard placements.

3.9.1. TACAN. When used for instrument procedures, recommended placement is 150 feet right of runway centerline abeam the first set of approach lights in an area free of excessive aircraft, vehicle, and troop movements.

3.9.2. Radar Beacons. Since radar beacons transmit signals via “line-of-sight,” terrain on the ALZ and along the inbound course must be taken into consideration to allow the earliest possible acquisition. Ensure aircrews are briefed on beacon placement.

3.9.2.1. AMP-3 Landings. Place one radar beacon (code 2) 150 feet left of runway centerline abeam the first set of steady lights (panels) in the touch down zone. Place a second beacon (code 1) 150 feet left of the departure end flashing strobe.

3.10. ALZ Personnel.

3.10.1. Minimum Personnel. Training operations require an Assault Landing Zone Safety Officer (ALZSO) and may require an Assault Landing Zone Controller (ALZC).

3.10.2. The ALZC's primary function is to provide air traffic control services.

3.10.2.1. The ALZC will be a qualified combat controller certified by the unit commander as capable of performing unilateral or joint air traffic control duties. ST units are authorized to combine ALZC/ALZSO functions during single-ship VFR operations. When combined, ALZSO skill level requirements must be met.

3.10.3. The ALZSO will normally be a qualified E-5 or above (seven or nine skill level) combat control NCO, combat control officer, or airlift aircrew officer certified by the unit commander as capable of performing as an ALZSO.

3.10.3.1. During visual flight rules (VFR) operations not requiring Air Traffic Control (ATC) services, qualified Air Force Reserve Command (AFRC), Air National Guard (ANG), and AF active duty personnel designated by their commander may establish and operate ALZs. If the ALZ is semi-prepared, they are restricted to operations on their local training ALZ. These personnel assume the ALZSO responsibilities listed in paragraph 3.10.4..

3.10.3.2. USSOCOM units listed in paragraph 2.18.1.3. are authorized to use qualified personnel to establish ALZs with overt AMP-2 markings supporting single-ship VMC operations that do not require air traffic control services. These personnel assume the ALZSO responsibilities listed in paragraph 3.10.4.

3.10.4. The ALZSO represents the Air Force forces commander as provided in the mission directives and is responsible for the following:

3.10.4.1. Ensures required crash, fire, and rescue (CFR) coverage is at the ALZ prior to beginning airland operations, and ensures continuous contact with CFR is maintained.

3.10.4.2. Maintains close liaison with the using unit commander, or designated representative, during joint operations.

3.10.4.3. Observing and evaluating all factors which may adversely affect the safety and efficiency of the operation.

3.10.4.4. Inspecting the ALZ prior to use IAW paragraph 3.5., and validating the ALZ meets criteria listed on the current ALZ survey.

3.10.4.5. Monitoring the conditions of the landing, taxi, and parking areas.

3.10.4.6. Ensures ALZ markings and NAVAID placement are correct and operating.

3.10.4.7. Ground handling and marshaling of aircraft.

3.10.4.8. Evaluating and reporting surface wind and meteorological phenomenon.

3.10.4.9. Ensuring the dissemination of available altimeter settings.

3.10.4.10. Formulating minimum safe altitudes and monitoring the deconfliction of artillery and close air support operations.

3.10.4.11. Advising the ALZC if conditions are unsafe for landing operations and ensures cancellation of operations is relayed to appropriate agencies.

3.10.4.12. Supervises all Air Force personnel on the ALZ

3.10.4.13. The ALZSO must maintain contact with the ALZC during the operation.

3.11. Crash, Fire, and Rescue (CFR) Requirements. Specific requirements for CFR are contained in MAJCOM (i.e., AMCI 11-208, *Tanker/Airlift Operations*) publications. When CFR is required during training operations, the user will preposition suitable equipment at the ALZ prior to conducting the operation.

3.12. ALZ Review Process . The following paragraphs outline the ALZ survey process from performing the initial groundwork to the final incorporation of the ALZ into the assault zone database and AZAR. The AZAR is a comprehensive listing of assault zones in the assault zone database available for use by the DoD. Use of the AZAR will expedite mission planning, enhance safety, and avoid duplication of surveys. Information in the AZAR does not replace the need for a completed survey prior to conducting assault zone operations. All completed surveys will be forwarded by the appropriate agencies to HQ AMC/DOK for inclusion in the worldwide assault zone database. ALZ surveys become obsolete 5 years after the final review date and must be resurveyed prior to use. Procedures for requesting an initial or re-survey of an ALZ are contained in paragraph 1.5.

3.12.1. ST personnel normally complete the AF Form 3822, **Assault Landing Zone Survey**.

3.12.2. Following completion of the ground survey by ST personnel, AF Form 3822 is forwarded to the appropriate Air Component Commander's safety-of-flight review and approval agency.

3.12.3. The AF Form 3822 is not valid for use until it has been reviewed and recommended for use by the appropriate Air Component Commander. The AF Form 3822 is then forwarded for inclusion in the assault zone database.

3.12.4. AF Form 3822 documents the conditions that existed at the time the survey was accomplished. The condition of the ALZ should be confirmed prior to commencing operations.

3.13. Forms Prescribed. The following forms are referenced in this publication; AF Form 3822 and AF Form 3823.

Figure 3.9. Standard/Metric Conversion Chart.

STANDARD/METRIC CONVERSION CHART Factors for Conversion of Units To convert A to B, multiply A by C. To convert B to A, multiply B by D.			
UNIT A	**UNIT C**	**UNIT D**	**UNIT B**
LENGTH			
Statute Miles	5,280.0	0.0001894	Feet
Statute Miles	1.609	0.6214	Kilometers
Nautical Miles	1.1516	0.8684	Miles
Meters	3.281	0.3048	Feet
Kilometers	3,281.0	0.0003048	Feet
Yards	3.0	0.33333	Feet
Inches	2.540	0.3937	Centimeters
Feet	0.1667	6.0	Fathoms
VELOCITIES			
Miles Per Hour (Statute)	1.467	0.6818	Ft. Per Second
Meters Per Second	3.281	0.3048	Ft. Per Second
Meters Per Second	2.237	0.4470	Miles Per Hr. (Statute)
Yards/Second	2.355	0.4246	Knots
WEIGHT			
Ounces	0.0625	16.0	Pounds
Pounds	7000.0	0.0001429	Grains
Kilograms	2.205	0.4536	Pounds
Short Tons	2000.0	0.0005	Pounds
Short Tons	0.91	1.0989	Long Tons
Long Tons	1120.0	0.8729	Short Tons
ANGULAR MEASURE			
Circle	360.0		Degrees
Degrees	60.0	0.1667	Minutes
Degrees	17.8	0.056	Mils
Mils	3.27	0.296	Minutes
Minutes	60.0	0.01667	Seconds
TEMPERATURE CONVERSION To convert Fahrenheit to Centigrade, subtract 32 degrees and multiply by 5, then divide by 9. To convert Centigrade to Fahrenheit, multiply by 9, divide by 5, and add 32 degrees.			

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DCS/Air & Space Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

Abbreviations and Acronyms

ACA—Airspace Control Authority

ACC—Air Component Commander

ADEP—alternating door exit procedures technique

AGL—above ground level

ALZ—assault landing zone

ALZC—assault landing zone controller

ALZSO—assault landing zone safety officer

AMP—airfield marking pattern

AOC—air operations center

ASCC—air standardization coordinating committee

ATC—air traffic control

AWADS—Adverse Weather Aerial Delivery System

AZAR—Assault Zone Availability Report

CARP—Computed Air Release Point

CCT—Combat Control Team (see Special Tactics)

CDS—Container Delivery System

CFR—Crash Fire and Rescue

CJSOAC—Combined Joint Special Operations Air Component

COMAFSOF—Commander, Air Force Special Operations Forces

CRRC—Combat Rubber Raiding Craft

CRS—container release system

DIRMOBFOR—Director of Mobility Forces

DZ—Drop Zone

DZC—Drop Zone Controller

DZSO—Drop Zone Safety Officer

DZST—Drop Zone Safety Officer

DZSTL—Drop Zone Support Team Leader

FAA—Federal Aviation Administration

GAR-I—

GMRS—Ground Marked Release System

GPS—global positioning system

GFR—General Flight Rules

HAARS—High Altitude Airdrop Resupply System

HALO—High Altitude Low Opening Parachute Technique

HARP—high altitude release point

HE—heavy equipment

HLZ—Helicopter Landing Zone

HN—host nation

HSK—High Speed Kit

HSSLADS—High Speed Low Level Aerial Delivery System

HVCDS—High Velocity Container Delivery System

ICAO—International Civil Aviation Organization

IFR—instrument flight rules

IMC—instrument meteorological conditions

JA/ATT—Joint Airborne/Air Transportability Training

JFACC—joint forces air component commander

JMD—Jumpmaster Directed

LZ—landing zone

MAF—Mobility Air Forces

MAAS—Mobile Aircraft Arresting System

MDS—mission design series

MEW—mean effective wind

MMLS—mobile microwave landing system

MPI—Multiple Points of Impact

MSL—Mean Sea Level

NOTAM—notice to airmen

PI—point(s) of impact

RAM—raised angle marker

RCL—Reception Committee Leader

RPI—Random Points of Impact

SATB—Simulated Air Training Bundle

SKE—Station Keeping Equipment

ST—special tactics

STS—special tactics squadron

STANAG—standardization agreement (NATO)

STARS—Special Tactics And Rescue Specialists

TACAN—tactical aid navigation

TALO—theater airlift liaison officer

TOT—Time Over Target

VAMP—Visual Assault Zone Marker Panels

VIRS—Verbally Initiated Release System

VFR—visual flight rules

VMC—visual meteorological conditions

WDI—wind drift indicator

Terms

Airlift Coordination Cell.—A cell within the air operations center, which plans, coordinates, manages and executes theater airlift operations in the area of responsibility or joint operations area. Normally consists of an airlift plans branch, an airlift operations branch, and an airlift logistics branch. (Joint Pub 1-02)

Air Mobility Element.—The air mobility element is an extension of the Air Mobility Command Tanker Airlift Control Center deployed to a theater when requested by the geographic combatant commander. It coordinates strategic airlift operations with the theater airlift management system and collocates with the air operations center whenever possible. (Joint Pub 1-02)

Airfield Marking Pattern.—A system of designations that differentiate between the various types of airfield markings.

Airport Traffic Area.—Unless otherwise specifically designated, that airspace within a horizontal radius of five statute miles from the geographic center of any airport at which a control tower is operating, extending from the surface up to, but not including an altitude of 3,000 feet above the elevation of the airport.

Assault Landing Zone.—A paved (referred to in other documents as shortfield) or semi-prepared (unpaved) airfield used to conduct operations in an airfield environment similar to forward operating locations. A semi-prepared ALZ (formerly designated as Assault Landing Zones (ALZs) and Field Landing Strips (FLSs) refers to an unpaved ALZ. The amount of engineering effort required to develop a semi-prepared ALZ depends on the planned operation, the service life needed to support these operations, and the existing soil and weather conditions. Semi-prepared construction/maintenance preparations may range from those sufficient for limited use to those required for continuous routine operations. Options for surface preparation may include stabilization, addition of an aggregate course, compaction of in-place soils, or matting. Since training airfields are constructed for long-term operations, semi-prepared surface structural requirements are more stringent than for contingency airfields. Stabilization may be required."

Assault Landing Zone Controller.—Individual performing ATC duties during ALZ operations.

Assault Landing Zone Safety Officer.—Qualified combat controller or officer aircrew member in charge of the ALZ operation.

Assault Zone.—A generic term used to include DZs, ALZs, and HLZs.

Class D Airspace.—Category of controlled airspace, which generally consists of the area from the surface to 2,500 feet MSL surrounding airports with an operational tower. No separation services are provided to VFR aircraft in class D airspace.

Direct Air Delivery.—The strategic air movement of cargo or personnel from an airlift point of embarkation to a point as close as practicable to the user's specified final destination, thereby minimizing transshipment requirements. Air direct delivery eliminates the traditional Air Force two step strategic and theater airlift transshipment mission mix. (Joint Pub 1-02)

Director of Mobility Forces.—The director of mobility forces will normally be a senior officer who is familiar with the area of responsibility (AOR) or joint operations area (JOA) and possesses an extensive background in airlift operations. When established, the DIRMOBFOR serves as the designated agent of the Air Force Component Commander of Joint Force Air Component Commander, if designated, for all airlift issues in the AOR or JOA, and for other duties as directed. The DIRMOBFOR exercises coordinating authority between the airlift coordination cell, the air mobility element, the Tanker Airlift Control Center, the joint movement center, and the air operations center in order to expedite the resolution of airlift problems. The DIRMOBFOR may be sourced from the theater's organizations, United States Transportation Command, or United States Atlantic Command. (Joint Pub 1-02)

Drop Zone Controller.—Qualified individual in charge of a DZ operation who represents the appropriate commander as provided in the mission directive.

Drop Zone Safety Officer.—The appointed representative of the airborne commander who is responsible for the safe operation of the DZ. Specific duties and responsibilities vary according to the using airborne unit's standard operating procedures (SOPs).

Drop Zone Support Team.—Qualified U.S. Army/Marine Corps team responsible for supporting DZ operations IAW this publication and memorandum of agreement.

Drop Zone Support Team Leader.—Individual in charge of U.S. Army/Marine Corps DZST.

Ground Marked Release System.—A procedure used by ground forces to determine and mark the release point for an airdrop.

Mean Effective Wind.—A theoretical wind of constant velocity and direction, extending from the surface to a predetermined altitude above the ground.

Military Free Fall.—An employment concept encompassing both HALO and HAHO techniques of parachuting.

Point of Impact.—The point on the DZ where the first parachutist or airdropped cargo item lands or is expected to land.

Raised Angle Marker.—A device used to mark the point of impact during airdrops. A triangular shaped marker constructed of bright orange material, six feet wide at the base (minimum) and 6 feet high (minimum), displayed at a 60 degree angle into the direction of flight.

Ram Air Parachute System.—US Army equivalent of a HGRP.

Release Point.—The point over the DZ where personnel or equipment should exit the drop aircraft.

Station Keeping Equipment.—An aircraft avionics system which can be used to maintain formation position in Instrument Meteorological Conditions (IMC). When used in conjunction with an AWADS lead aircraft, IMC airdrops are possible. C-130, C-141, and C-17 SKE-equipped aircraft have an IMC airdrop capability when employed with a ground-based zone marker.

Special Operations Forces.—Those active and reserve component forces of the Military Services designated by the Secretary of Defense and specifically organized, trained, and equipped to conduct and support special operations. (Joint Pub 1-02)

Special Operations Low Level.—MAF C-141 and C-5 qualified aircrews that support special operations using non-standard procedures and criteria, including operations using night vision goggles. AMC provides NVG trained C-130 crews capable of using procedures similar to SOLL aircrew. These C-130 aircrew are notionally referred to as C-130 NVG.

Special Tactics Team.—An Air Force team composed combat control, pararescue, and combat weather personnel who are organized, trained, and equipped to establish and control the air-ground interface and provide airmanship skills in the objective area. Functions include assault zone assessment, establishment, and control; combat search and rescue, trauma medical treatment and personnel recovery; terminal attack control, and tactical weather observations and forecasting.

Theater Airlift Liaison Officer.—An officer specially trained to implement the theater air control system and to control tactical airlift assets. Theater airlift liaison officers are highly qualified, rated airlift officers, with tactical (airdrop) airlift experience, assigned duties supporting US Army units.

Trailing Edge of a DZ.—Represents the imaginary line extending between the left and right rear corners of a surveyed DZ.

Unilateral.—Describes an Air Force only operation. A unilateral mission will not be considered a joint operation merely because the parachutists or loads are from another service. Example: an Air Force reserve airlift unit conducting training airdrop missions using Army paratroopers or when Army paratroopers jump with Air Force personnel on an Air Force unit's operation.

Visual Initiated Release System.—A method of positioning aircraft for airdrop by verbal instruction from the DZC.

Visual Meteorological Conditions.—Weather conditions in which visual flight rules apply; expressed in terms of visibility, ceiling height, and aircraft clearance from clouds along the path of flight. When these criteria do not exist, instrument meteorological conditions prevail and instrument flight rules must be followed.

Wind drift indicator.—A 5 to 6 foot length of paper approximately

Zone Marker.—An electronic NAVAID used by specially equipped aircraft to aid in positioning over the AZ or release point.

Attachment 2

WIND/SEA STATE PREDICTION CHART

Wind Velocity (Knots)	Wind Force (Beaufort)	Average. Wave Ht. (Feet)	Sea Indications	Sea State
0	0	0	Like mirror.	0
Calm 1 - 3	1	0.05	Ripples with appearance of scales	0
Light Air 4 - 6	2	0.18	Small wavelets; crests have glassy appearance but do not break.	1
Light Breeze 7 - 10	3	0.6	Large wavelets; crests begin to break; scattered whitecaps.	2
Gentle Breeze 11 - 16	4	2.0	Small waves, becoming longer. Fairly frequent whitecaps	3
Moderate Breeze 17 - 21	5	4.3	Moderate waves, taking a pronounced long form; many whitecaps.	4
Fresh Breeze 22 -27	6	8.2	Large waves begin to form; white foam crests more extensive; some spray.	5
Strong Breeze 28 - 33	7	14	Sea heaps up, white foam from breaking waves blown in streaks along direction of waves.	6
Moderate Gale				

34 - 40	8	30	Moderately high waves of greater length; crests break into spindrift; foam blown in well marked streaks in direction of wind.	7
Fresh Gale				
41 - 47	9	36	High waves. Dense streaks of foam; sea begins to roll; spray affects visibility.	8
Strong Gale				
48 - 55	10	52	Very high waves with overhanging crests; foam in great patches blown in dense white streaks. Whole surface of the sea takes on a white appearance. Visibility-affected.	9
Storm				
56 - 63	11	64	Exceptionally high waves (64 feet). Sea is covered with long white patches of foam Edges of wave crests are blown into froth. Visibility seriously affected.	9.1
Violent Storm (Hurricane)				
64 - 136+	12-17	80 (est.)	Air filled with foam (80+feet). Sea is white. Visibility very seriously affected.	9.2